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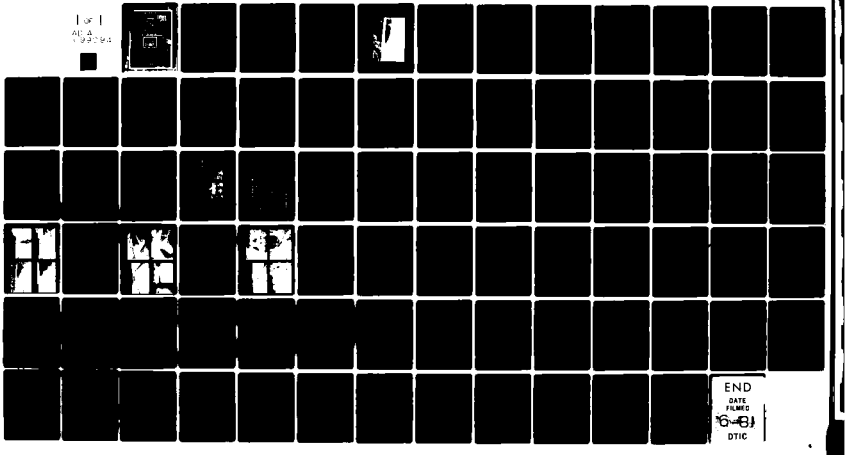

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DELAWARE RIVER BASIN,
TOMS CREEK, PIKE COUNTY, Pennsylvania.

PENNSYLVANIA.

LEVEL

National Dam Inspection Program.

POCONO MOUNTAIN LAKE DAM

NDI I.D. PA-00767
PENNDER I.D. 52-171

Number

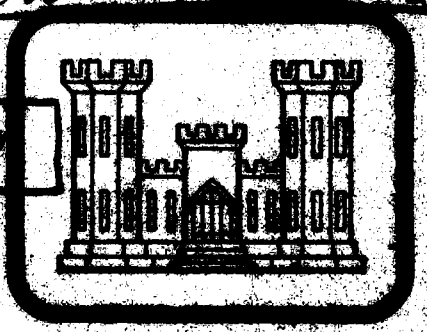
POCONO MOUNTAIN LAKE ESTATES COMMUNITY ASSOCIATION

PHASE I INSPECTION REPORT.

NATIONAL DAM INSPECTION PROGRAM

DACW31-81-C-0057

Bernard M. Mihaku



PREPARED FOR

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

PREPARED BY

CAI CONSULTANTS, INC.
[illegible] BRATT ROAD
[illegible], PENNSYLVANIA [illegible]
SINCE 1961

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Design Flood is based on the estimated Probable Maximum Flood (greatest reasonably possible storm runoff) for the region, or fractions thereof. The Spillway Design Flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition, and the downstream damage potential.

Breach analyses are performed, when necessary, to provide data to assess the potential for downstream damage and possible loss of life. The results are based on specific theoretical scenarios peculiar to the analysis of a particular dam and are not applicable to other related studies such as those conducted under the Federal Flood Insurance Program.

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

ABSTRACT

Pocono Mountain Lake Dam: NDI I.D. No. PA-00767

Owner:	Pocono Mountain Lake Estates Community Association
State Located:	Pennsylvania (PennDER I.D. No. 52-171)
County Located:	Pike
Stream:	Toms Creek
Inspection Date:	20 October 1980
Inspection Team:	GAI Consultants, Inc. 570 Beatty Road Monroeville, Pennsylvania 15146

Based on a visual inspection, operational history, and available engineering data, the dam is considered to be in good condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility is capable of accommodating a 1/2 PMF event. Specifically, the facility will pass and/or store about 84 percent of the PMF prior to embankment overtopping. Consequently, the spillway is considered adequate.

It is recommended that the owner immediately:

a. Exterminate burrowing animals that are possibly inhabiting the embankment and refill their burrows with earth.

b. Repair all deteriorated concrete associated with the spillway.

c. Continue to observe, in all future inspection, the seepage encountered downstream of the outlet conduit noting any turbidity and/or changes in rate of flow.

Pocono Mountain Lake Dam: NDI I.D. No. PA-00767

d. Develop formal manuals of operation and maintenance to ensure future proper care and operation of the facility. Included in the manuals should be a formal warning system for the notification of downstream inhabitants should hazardous embankment conditions develop with provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

GAI Consultants, Inc.

Bernard M. Mihalcin P.E.

Date 27 March 1981

Approved by:

JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date 15 APR 81

OVERVIEW PHOTOGRAPH

TABLE OF CONTENTS

TABLE OF CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
POCONO MOUNTAIN LAKE DAM
NDI #PA-00767, PennDER #52-171

SECTION 1
GENERAL INFORMATION

1.0 Authority.

The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.

1.1 Purpose.

The purpose is to determine if the dam constitutes a hazard to human life or property.

1.2 Description of Project.

a. Dam and Appurtenances. Pocono Mountain Lake Dam is a 22-foot high, homogeneous earth embankment approximately 970 feet long, including spillway. The facility is constructed with an uncontrolled, rectangular shaped, concrete chute channel spillway located near the center of the embankment. Spillway discharges are regulated by a concrete, ogee-type weir. Drawdown capacity is provided by an 18-inch diameter reinforced concrete pipe located to the right of the spillway. Flows through the conduit are controlled at the inlet by an 18-inch diameter slide gate that is manually operated from atop the embankment crest.

b. Location. Pocono Mountain Lake Dam is located across Toms Creeks in Lehman Township, Pike County, Pennsylvania. The dam is part of a residential development known as Pocono Mountain Lake Estates which is located about 4.2 miles north of U.S. Route 209 at Egypt Mills, Pennsylvania. The dam, reservoir and watershed are contained within the Lake Maskenozha, Pennsylvania-New Jersey, 7.5 minute U.S.G.S. topographic quadrangle (see Figure 1, Appendix E). The coordinates of the dam are N41°9.9' and W74°58.8'.

c. Size Classification. Small (22 feet high, 146 acre-feet storage capacity at the top of the dam).

d. Hazard Classification. High (see Section 3.1.e).

e. Ownership. Pocono Mountain Lake Estates
Community Association
Sections 1, 2, 3 and 4
P.O. Box 104
Bushkill, Pennsylvania 18324
ATTN: Mr. Frank Cwik
Maintenance Superintendent

f. Purpose. Recreation.

g. Historical Data. Pocono Mountain Lake Dam was constructed in 1972-73 as part of a real estate development venture funded by Pocono Mountain Lake Estates, Inc. of Englewood Cliff, New Jersey (John J. Fiume, President). The facility was designed by the E.C. Hess Associates, Inc. of Stroudsburg, Pennsylvania. Subsequent to completion of the facility, contractural disagreements, however, between the developer and individuals within the development community prompted legal action whereby a class action suit was filed against the developer and its owner on behalf of the Pocono Mountain Lake Estates Community Association. According to interviews with members of the Association, the courts reportedly awarded the dam and lake to the Association as part of a damage settlement. No modifications have been made to the facility since its completion.

1.3 Pertinent Data.

a. Drainage Area (square miles). 0.3

b. Discharge at Dam Site.

Discharge Capacity of Outlet Conduit - Discharge curves are not available.

Discharge Capacity of Spillway at Maximum Pool ≅ 570 cfs (see Appendix D, Sheet 12).

c. Elevations (feet above mean sea level). The following elevations were obtained from design drawings and through field measurements based on the elevation of normal pool at 1140.0 feet (see Appendix D, Sheets 1 and 2).

Top of Dam	1145.0 (design). 1144.6 (field).
Maximum Design Pool	1145.0
Maximum Pool of Record	Not known.
Normal Pool	1140.0 (assumed datum).
Spillway Crest	1140.0
Upstream Inlet Invert	1123.0 (design).
Downstream Outlet Invert	1123.0 (field).
Streambed at Dam Centerline	1123.0
Maximum Tailwater	Not known.

d. Reservoir Length (feet).

Top of Dam	1500
Normal Pool	1400

e. Storage (acre-feet).

Top of Dam	146
Normal Pool	74

f. Reservoir Surface (acres).

Top of Dam	19
Normal Pool	13

g. Dam.

Type	Homogeneous earth.
Length	954 feet (excluding spillway).
Height	22 feet (field measured; embankment crest to downstream outlet invert).
Top Width	15 feet (design). 14 feet (field).
Upstream Slope	2.5H:1V
Downstream Slope	2.5H:1V
Zoning	Homogeneous fill with small granular downstream toe drain (see Figure 2).
Impervious Core	None indicated.
Cutoff	Trapezoidal shaped trench with 10-foot bottom width and 1H:1V side slopes located just upstream of embankment centerline (see Figure 2).
Grout Curtain	None indicated.

h. Diversion Canal and Regulating Tunnels. None.

i. Spillway.

Type	Uncontrolled, rectangular shaped, concrete chute channel with an ogee-type weir located near the center of the embankment.
Crest Elevation	1140.0 feet.
Crest Length	16 feet.

j. Outlet Conduit.

Type	18-inch diameter reinforced concrete pipe.
Length	Approximately 110 feet (see Figure 5).
Closure and Regulating Facilities	18-inch diameter slide gate located at the inlet.
Access	Control mechanism is manually operated from atop the embankment crest.

SECTION 2

ENGINEERING DATA

2.1 Design.

a. Design Data Availability and Sources. No formal design reports or calculations are available concerning any aspect of this facility. PennDER files contain a complete set of four design drawings by the E.C. Hess Associates, Inc., dated 1971. These drawings have been included in Appendix E of this report (see Figures 2 through 5). A construction permit application report, issued by the state and dated 1972, is also available in PennDER files. This report contains a brief description of some of the various design aspects of the facility.

b. Design Features.

1. Embankment. Design features of the embankment are presented in Figure 2. As indicated, the structure is composed of homogeneous earthfill. Its upstream and downstream faces are sloped at 2.5H:1V and its crest measures 14 feet wide. A layer of riprap is provided on a portion of the upstream face while the remainder of the embankment is grass covered. The design provides for a gravel filter along the downstream embankment toe and trapezoidal shaped cutoff trench located ten feet upstream of the embankment centerline along the entire length of the embankment. The cutoff trench reportedly extends to bedrock or five to ten feet into impervious material, and has a 10-foot bottom width with 1H:1V side slopes.

2. Appurtenant Structures.

a) Spillway. Design features of the spillway are presented in Figures 3 and 5. It is noted that the configuration of the discharge channel downstream of the baffle blocks is not accurately depicted in these figures (see Photographs 5, 7 and 8). The spillway is an uncontrolled, rectangular shaped, concrete chute channel with an ogee-type weir located near the center of the embankment. The weir crest is 16 feet long and about five feet below the tops of the channel wingwalls. Beyond the concrete channel, a 400-foot long, trapezoidal shaped, rock lined channel directs discharges back into the original stream channel below the embankment.

b) Outlet Conduit. Design features of the outlet conduit are presented in Figures 4 and 5. As shown, the outlet conduit is 18-inch diameter reinforced concrete pressure pipe placed on a concrete cradle for its full length through the base of the embankment fill. Flow through the conduit is controlled by an 18-inch diameter slide gate located on the inlet and manually operated from atop the embankment crest. The channel at the discharge end of the conduit is rock lined for a distance of 20 feet.

c. Specific Design Data and Criteria. No specific design data or information relative to design procedures are available other than the general notes contained in the available drawings.

2.2 Construction Records.

No formal construction records are available for this facility. Brief correspondence in PennDER files indicates that construction was inspected by the designer, Edward C. Hess Associates, Inc.

2.3 Operational Records.

No records of the day-to-day operation of the facility are available.

2.4 Other Investigations.

There are no available records concerning formal studies or investigations of Pocono Mountain Lake Dam since its completion.

2.5 Evaluation.

The available data are considered sufficient to make a reasonable Phase I evaluation of the facility.

SECTION 3

VISUAL INSPECTION

3.1 Observations.

a. General. The general appearance of the facility suggests the dam and its appurtenances are in good condition.

b. Embankment. Observations made during the visual inspection indicate the embankment is in good condition. No evidence of sloughing, erosion, seepage through the downstream embankment face, excessive settlement, or signs of maintenance neglect were observed (see Photographs 1, 2, 3 and 4). An area of seepage, estimated at about one to two gallons per minute (gpm), was observed in the outlet conduit discharge channel approximately 160 feet beyond the downstream embankment toe. The ponded water shown in Photograph 12 appears to collect primarily from this seepage source. Another possible deficiency encountered was an apparent animal burrow observed along the lower downstream embankment face between the right abutment and outlet conduit.

c. Appurtenant Structures.

1. Spillway. The visual inspection revealed the spillway is in good condition (see Photographs 5, 6, 7 and 8). The extreme upstream portion of the left wingwall exhibits an area of spalling that should be repaired while the overall structure, in general, displays minor cracking and scaling of little significance, at present.

2. Outlet Conduit. The outlet conduit has reportedly not been operated in several years. The visible exposed portions of this appurtenance, however, appear to be in excellent condition. No evidence of significant deterioration was observed.

d. Reservoir Area. The Pocono Mountain Lake watershed consists of moderate to steep, heavily forested slopes. Numerous access roads and dwellings have already been constructed within the boundaries of the watershed and future expansion appears likely. Thus, the current complexion of the watershed is considered temporary.

e. Downstream Channel. Discharge from Pocono Mountain Lake Dam flows through a steep, narrow and heavily forested valley with steep confining slopes. Two inhabited dwellings are located near the streambed along the banks of Toms Creek approximately 2.1 miles downstream of the embankment. No other inhabitable structures are located sufficiently near the streambed within the reach between the embankment and the confluence of Toms Creek and the Delaware River. It is estimated that four to ten lives could be affected as the result of an embankment breach. Consequently, the hazard classification is considered to be high.

3.2 Evaluation.

The overall condition of the facility based on visual observations is considered to be good. Remedial measures should be implemented to repair the minor deterioration associated with the spillway concrete and to exterminate rodents that inhabit the embankment and backfill their burrows. In addition, the seepage condition encountered downstream of the outlet conduit should continue to be observed in all future inspections.

SECTION 4

OPERATIONAL PROCEDURES

4.1 Normal Operating Procedure.

Pocono Mountain Lake Dam is essentially a self-regulating facility. That is, excess inflows are automatically discharged through the uncontrolled spillway and directed downstream. Typically, the outlet conduit is closed and reportedly has not been opened for several years. The conduit was not operated in the presence of the inspection team. No formal operations manual is available.

4.2 Maintenance of Dam.

The facility is reportedly maintained on an unscheduled basis by the owner's maintenance staff. No formal maintenance program has been established at this facility and no formal manuals are available.

4.3 Maintenance of Operating Facilities.

See Section 4.2 above.

4.4 Warning System.

No formal warning system is presently in effect.

4.5 Evaluation.

The general appearance of the facility suggests that it has been adequately maintained to date. No formal maintenance or operations manuals are available, but, are recommended to ensure the continued proper care and operation of the facility. In addition, formal warning system procedures should be incorporated into these manuals to provide for the protection of downstream residents should hazardous embankment conditions develop.

SECTION 5

HYDROLOGIC/HYDRAULIC EVALUATION

5.1 Design Data.

No formal design reports are available for this facility. According to information contained in PennDER files, the spillway at Pocono Mountain Lake Dam was sized with sufficient capacity to exceed 1972 state requirements of 450 cfs as established by the Pennsylvania "C" Curve.

5.2 Experience Data.

Daily records of reservoir levels and/or spillway discharges are not available. The general appearance of the facility suggests adequate past performance.

5.3 Visual Observations.

On the date of inspection, no conditions were observed that would indicate the facility could not perform satisfactorily within the limits of its design capacity.

5.4 Method of Analysis.

The facility has been analyzed in accordance with the procedures and guidelines established by the U.S. Army, Corps of Engineers, Baltimore District, for Phase I hydrologic and hydraulic evaluations. The analysis has been performed utilizing a modified version of the HEC-1 program developed by the U.S. Army, Corps of Engineers, Hydrologic Engineering Center, Davis, California. Analytical capabilities of the program are briefly outlined in the preface contained in Appendix D.

5.5 Summary of Analysis.

a. Spillway Design Flood (SDF). In accordance with procedures and guidelines contained in the National Guidelines for Safety Inspection of Dams for Phase I Investigations, the Spillway Design Flood (SDF) for Pocono Mountain Lake Dam ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. This classification is based on the relative size of the dam (small) and the potential hazard of dam failure to downstream developments (high). Since the facility is classified near the lower bounds of the small category, the SDF for the facility is considered to be the 1/2 PMF.

b. Results of Analysis. Pocono Mountain Lake Dam was evaluated under near normal operating conditions. That is, the reservoir was initially at its normal pool or spillway elevation of approximately 1140.0 feet, with the spillway weir discharging freely. The outlet conduit was assumed to be non-functional for the purpose of analysis, since the discharge capacity of the conduit is not such that it would significantly increase the total discharge capabilities of the dam and reservoir. The spillway consists of an uncontrolled, rectangular shaped, concrete chute channel with a concrete ogee-type weir. All pertinent engineering calculations relative to the evaluation of this facility are provided in Appendix D.

Overtopping analysis (using the Modified HEC-1 computer program) indicated that the discharge/storage capacity of Pocono Mountain Lake Dam can accommodate storms in excess of the 1/2 PMF (SDF) or, specifically, about 84 percent of the PMF prior to embankment overtopping. The peak 1/2 PMF inflow of approximately 440 cfs was attenuated by the discharge/storage capabilities of the dam and reservoir such that the resulting peak outflow was about 320 cfs. The maximum water surface level of the reservoir under 1/2 PMF conditions was about 1143.2 feet, or 1.4 feet below the top of the dam (Appendix D, Summary Input/Output Sheets, Sheets B and C).

5.6 Spillway Adequacy.

Pocono Mountain Lake Dam was found to be capable of passing and/or storing the inflow resulting from a 1/2 PMF event (SDF), and therefore, its spillway is considered to be adequate.

SECTION 6

EVALUATION OF STRUCTURAL INTEGRITY

6.1 Visual Observations.

a. Embankment. Based on visual observations, the embankment is considered to be in good structural condition. The seepage condition encountered downstream of the embankment is not considered to be significant at this time. The condition should, however, continue to be observed in all future inspections specifically noting any turbidity and/or changes in rate of flow. The possibility of burrowing animals inhabiting the embankment is cause for some concern. Animal burrows may become paths for potential seepage and piping which could lead to failure of the structure. Care should taken to periodically search out and locate any burrows, exterminate the burrowing animals, and refill the burrows with earth.

b. Appurtenant Structures.

1. Spillway. The spillway is considered to be in good structural condition. Observed areas of minor concrete deterioration are not considered to be significant at this time. Nevertheless, repairs should be implemented immediately while the extent of the deterioration is still local.

2. Outlet Conduit. The outlet conduit is considered to be in excellent condition. No significant deficiencies were noted.

6.2 Design and Construction Techniques.

No information is available that details the methods of design and/or construction of the facility.

6.3 Past Performance.

There are no records documenting any events during which the facility has not adequately functioned.

6.4 Seismic Stability.

The dam is located in Seismic Zone No. 1 and may be subject to minor earthquake induced dynamic forces. As the facility appears to be well constructed and sufficiently stable, it is believed that it can withstand the expected dynamic forces; however, no calculations and/or investigations were performed to confirm this belief.

SECTION 7

ASSESSMENT AND RECOMMENDATIONS FOR REMEDIAL MEASURES

7.1 Dam Assessment.

a. Safety. The results of this investigation indicate the facility is in good condition.

The size classification of the facility is small and its hazard classification is considered to be high. In accordance with the recommended guidelines, the Spillway Design Flood (SDF) for the facility ranges between the 1/2 PMF (Probable Maximum Flood) and the PMF. Since the facility is classified near the lower bounds of the small category, the SDF is considered to be the 1/2 PMF. Results of the hydrologic and hydraulic analysis indicate the facility is capable of accommodating a 1/2 PMF event. Specifically, the facility will pass and/or store about 84 percent of the PMF prior to embankment overtopping. Consequently, the spillway is considered to be adequate.

b. Adequacy of Information. The available data are considered sufficient to make a reasonable Phase I assessment of the facility.

c. Urgency. The recommendations listed below should be implemented immediately.

d. Necessary for Additional Investigations. No additional investigations are deemed necessary at this time.

7.2 Recommendations/Remedial Measures.

It is recommended that the owner immediately:

a. Exterminate burrowing animals that are possibly inhabiting the embankment and refill the burrows with earth.

b. Repair all deteriorated concrete associated with the spillway.

c. Continue to observe, in all future inspections, the seepage encountered downstream of the outlet conduit noting any turbidity and/or changes in rate of flow.

d. Develop formal manuals of operation and maintenance to ensure future proper care and operation of the facility. Included in the manuals should be a formal warning system for the notification of downstream inhabitants should hazardous embankment conditions develop with provisions for around-the-clock surveillance of the facility during periods of unusually heavy precipitation.

APPENDIX A

VISUAL INSPECTION CHECKLIST AND FIELD SKETCHES

CHECK LIST
VISUAL INSPECTION
PHASE 1

NAME OF DAM Pocono Mountain Lake Dam STATE Pennsylvania COUNTY Pike

NDI # PA — 00767 PENNDER # 52-171

TYPE OF DAM Earth SIZE Small HAZARD CATEGORY High

DATE(S) INSPECTION 20 October 1980 WEATHER Overcast & Windy TEMPERATURE 45° @ 2:00 PM

POOL ELEVATION AT TIME OF INSPECTION 1137.2 Feet M.S.L.

TAILWATER AT TIME OF INSPECTION N/A M.S.L.

INSPECTION PERSONNEL	OWNER REPRESENTATIVES	*OTHERS*
B. M. Mihalcin	Pocono Mountain Lake Estates Community Association	
D. J. Spaeder	Frank Cwik - Maintenance Superintendent	
D. L. Bonk	Dave Stitt - Maintenance Crew Member	
	Jim Sattur - Maintenance Crew Member	

RECORDED BY D. L. Bonk

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00767
SURFACE CRACKS	None observed.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed. Rock lined v-ditch located along downstream toe between right abutment and natural ground knoll adjacent spillway. Small rock toe is located at the base of the downstream face across the entire length of the embankment.
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	None observed. Slopes covered primarily with crownvetch. Crest is mowed regularly.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical - Good (see "Profile of Dam Crest from Field Survey," Appendix A). Horizontal - Good.
RIPRAP FAILURES	None observed. Hard, durable, well graded sandstone riprap in excellent condition.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	Good.

EMBANKMENT

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00767
DAMP AREAS IRREGULAR VEGETATION (LUSH OR DEAD PLANTS)	None observed.
ANY NOTICEABLE SEEPAGE	Seepage (≃ 1 to 2 gpm) observed in outlet discharge channel about 160 feet downstream of outlet.
STAFF GAGE AND RECORDER	None.
DRAINS	Two six-inch diameter toe drains located in concrete outlet headwall to the left and right of the outlet. Not discharging.
MISCELLANEOUS	Possible animal burrow located along downstream embankment face 200 to 250 feet left of the right abutment.

OUTLET WORKS

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA- 00767
INTAKE STRUCTURE	Submerged, not observed.
OUTLET CONDUIT (CRACKING AND SPALLING OF CONCRETE SURFACES)	18-inch diameter concrete pressure pipe. Not exposed, except at discharge end.
OUTLET STRUCTURE	Small concrete headwall at discharge end of outlet conduit in good condition.
OUTLET CHANNEL	Small, trapezoidal shaped, rock lined channel.
GATE(S) AND OPERATIONAL EQUIPMENT	18-inch diameter slide gate manually operated from embankment crest. Operating mechanism appears to be in good condition, but reportedly has not been operated for several years.

EMERGENCY SPILLWAY

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00767
TYPE AND CONDITION	Uncontrolled, rectangular shaped, concrete chute channel with an ogee-type weir in good condition.
APPROACH CHANNEL	Rock lined.
SPILLWAY CHANNEL AND SIDEWALLS	Minor vertical cracking observed in the sidewalls particularly around the weepholes. Channel floor exhibits minor scaling. A small spalled area is located at the upstream end of the left sidewall.
STILLING BASIN PLUNGE POOL	None. Concrete energy dissipators located immediately beyond ogee weir.
DISCHARGE CHANNEL	Rectangular shaped, concrete chute discharges into a trapezoidal shaped, rock lined channel.
BRIDGE AND PIERS EMERGENCY GATES	None.

SERVICE SPILLWAY

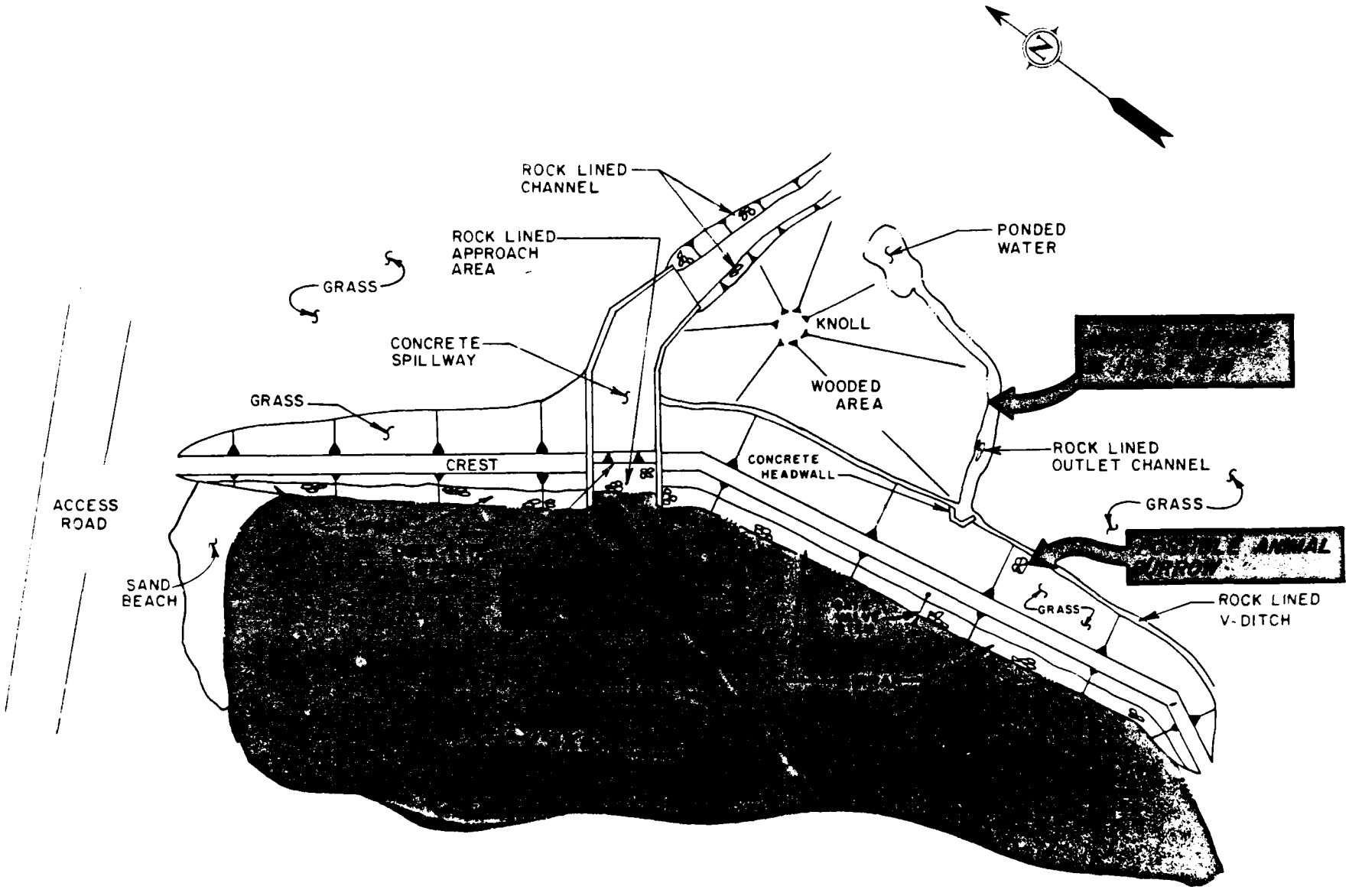
ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00767
TYPE AND CONDITION	N/A.
APPROACH CHANNEL	N/A.
OUTLET STRUCTURE	N/A.
DISCHARGE CHANNEL	N/A.

INSTRUMENTATION

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00767
MONUMENTATION SURVEYS	None.
OBSERVATION WELLS	None.
WEIRS	None.
PIEZOMETERS	None.
OTHERS	

RESERVOIR AREA AND DOWNSTREAM CHANNEL

ITEM	OBSERVATIONS/REMARKS/RECOMMENDATIONS NDI# PA - 00767
SLOPES: RESERVOIR	Moderate to steep and heavily wooded.
SEDIMENTATION	None observed.
DOWNSTREAM CHANNEL (OBSTRUCTIONS, DEBRIS, ETC.)	Natural channel unobstructed except for several road culverts which it passes through between the embankment and the Delaware River.
SLOPES: CHANNEL VALLEY	Steep, narrow and heavily forested valley with steep confining slopes.
APPROXIMATE NUMBER OF HOMES AND POPULATION	Two inhabited dwellings are located near the streambed along the banks of Toms Creek approximately 2.1 miles downstream of the embankment. It is estimated that four to ten lives could be affected as the result of an embankment breach.

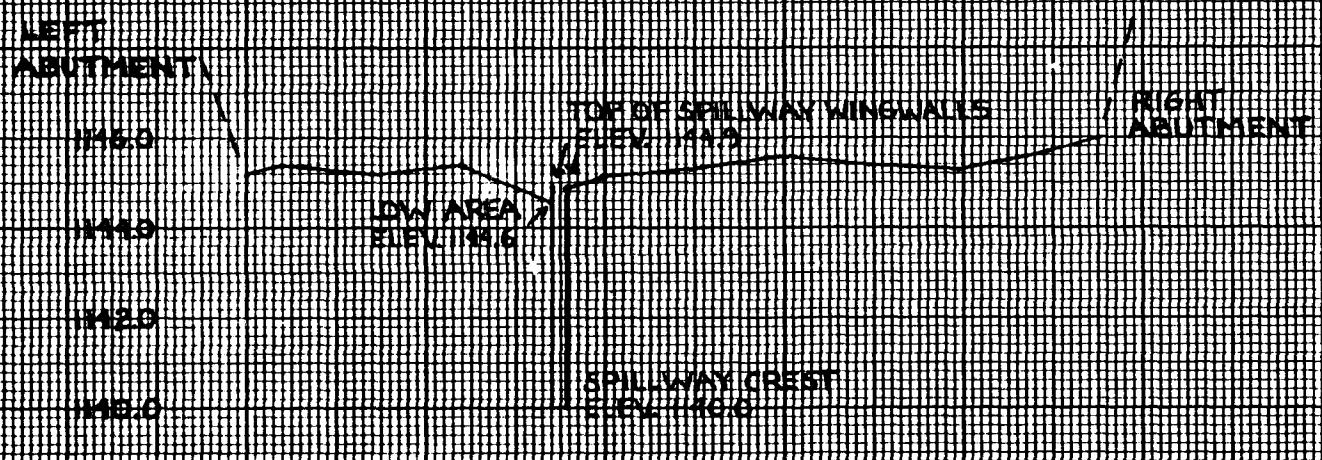


POCONO MOUNTAIN LAKE DAM
GENERAL PLAN-FIELD INSPECTION NOTES

NDIS # PA- 00742

POCONO MOUNTAIN LAKE DAM

PROFILE OF DAM CREST
FROM FIELD SURVEY



SCALE:
VERTICAL: 1 IN. = 4 FT
HORIZONTAL: 1 IN. = 200 FT

SUBJECT POCONO MOUNTAIN LAKE DAM
BY TATS DATE 3-12-81 SHEET NO. OF
CHKD. BY DATE 3-12-81 PROJECT NO. PO-238-781

APPENDIX B

ENGINEERING DATA CHECKLIST

CHECK LIST
ENGINEERING DATA
PHASE I

NAME OF DAM Pocono Mountain Lake Dam

ITEM	REMARKS NDI# PA - 00767
PERSONS INTERVIEWED AND TITLE	Pocono Mountain Lake Estates Community Association Frank Cwik - Maintenance Superintendent Dave Stitt - Maintenance Crew Member Jim Sattur - Maintenance Crew Member
REGIONAL VICINITY MAP	See Figure 1, Appendix E.
CONSTRUCTION HISTORY	Designed by E. C. Hess Associates, Inc., of Stroudsburg, Pennsylvania. Completed in November 1973.
AVAILABLE DRAWINGS	Complete set of four design drawings by E. C. Hess Associates, Inc., dated September 1971, are contained in PennDER files. See Figures 2 through 5, Appendix E.
TYPICAL DAM SECTIONS	See Figure 2, Appendix E.
OUTLETS: PLAN DETAILS DISCHARGE RATINGS	See Figures 4 and 5, Appendix E. Discharge rating curves are not available.

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00767
SPILLWAY: PLAN SECTION DETAILS	See Figures 3 and 5, Appendix E.	
OPERATING EQUIP- MENT PLANS AND DETAILS	See Figures 4 and 5, Appendix E.	
DESIGN REPORTS	None available.	
GEOLOGY REPORTS	None available.	
DESIGN COMPUTATIONS: HYDROLOGY AND HYDRAULICS STABILITY ANALYSES SEEPAGE ANALYSES	None available.	
MATERIAL INVESTIGATIONS: BORING RECORDS LABORATORY TESTING FIELD TESTING	Six test pits dug along embankment centerline. See Figure 2, Appendix E.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00767
BORROW SOURCES	Not known.	
POST CONSTRUCTION DAM SURVEYS	None.	
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Periodic water testing performed by state officials.	
HIGH POOL RECORDS	On the order of 1-foot over weir.	
MONITORING SYSTEMS	None.	
MODIFICATIONS	None.	

CHECK LIST
ENGINEERING DATA
PHASE I
(CONTINUED)

ITEM	REMARKS	NDI# PA - 00767
PRIOR ACCIDENTS OR FAILURES	None.	
MAINTENANCE: RECORDS MANUAL	No formal manual or records are available.	
OPERATION: RECORDS MANUAL	No formal manual or records are available.	
OPERATIONAL PROCEDURES	Self-regulating.	
WARNING SYSTEM AND/OR COMMUNICATION FACILITIES	None.	
MISCELLANEOUS		

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CHECK LIST
HYDROLOGIC AND HYDRAULIC
ENGINEERING DATA

NDI ID # PA-00767
PENNDER ID # 52-171

SIZE OF DRAINAGE AREA: 0.3 square miles.

ELEVATION TOP NORMAL POOL: 1140.0 STORAGE CAPACITY: 74 acre-feet.

ELEVATION TOP FLOOD CONTROL POOL: - STORAGE CAPACITY: -

ELEVATION MAXIMUM DESIGN POOL: - STORAGE CAPACITY: -

ELEVATION TOP DAM: 1144.6 STORAGE CAPACITY: 146 acre-feet.

SPILLWAY DATA

CREST ELEVATION: 1140.0 feet.

TYPE: Uncontrolled, rectangular shaped, concrete chute with ogee-type weir.

CREST LENGTH: 16 feet.

CHANNEL LENGTH: Approximately 60 feet.

SPILLOVER LOCATION: Near embankment center.

NUMBER AND TYPE OF GATES: None.

OUTLET WORKS

TYPE: 18-inch diameter reinforced concrete pipe.

LOCATION: About midway between spillway and right abutment.

ENTRANCE INVERTS: 1123.0 feet.

EXIT INVERTS: 1123.0 feet.

EMERGENCY DRAWDOWN FACILITIES: 18-inch diameter slide gate at inlet.

HYDROMETEOROLOGICAL GAGES

TYPE: None.

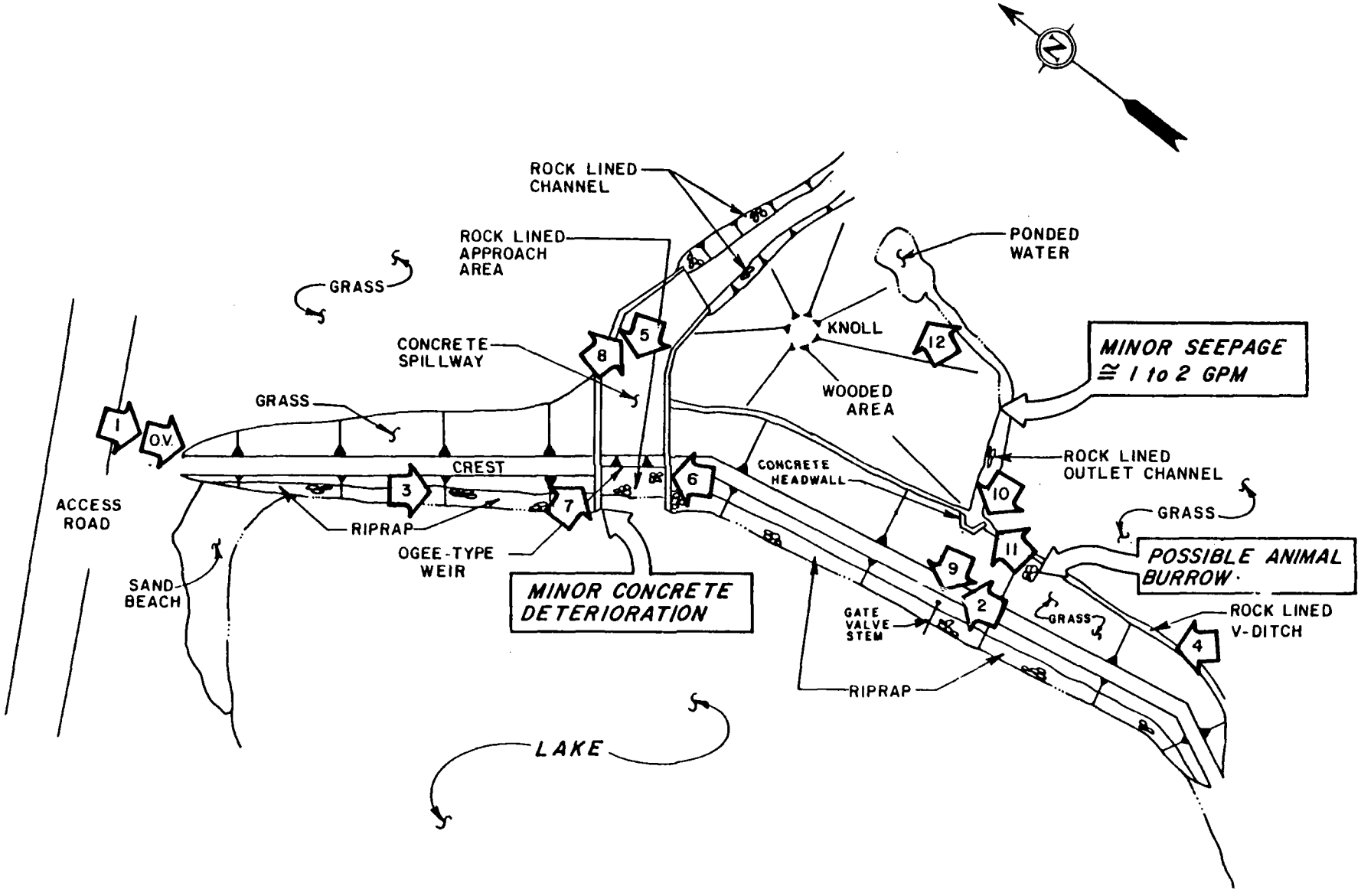
LOCATION -

RECORDS -

MAXIMUM NON-DAMAGING DISCHARGE: Not known.

APPENDIX C

PHOTOGRAPHS



POCONO MOUNTAIN LAKE DAM
PHOTOGRAPH KEY MAP

Photograph 1	Overview of Pocono Mountain Lake Dam as seen from the left abutment.
Photograph 2	View of the embankment crest looking toward the spillway and left abutment.
Photograph 3	View of the riprap protection covering the upstream embankment face.
Photograph 4	View of the downstream embankment face as seen from the right abutment.

1

2

3

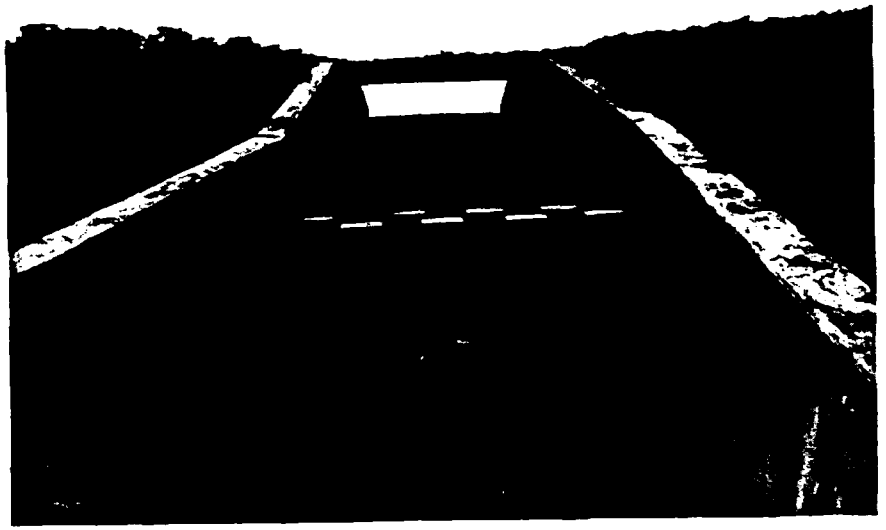
4

Photograph 5 View of the spillway channel looking upstream.

Photograph 6 Close-up view of the spillway weir and left wingwall.

Photograph 7 View, looking downstream, of the spillway forebay and concrete discharge channel.

Photograph 8 View, looking downstream, of the trapezoidal shaped discharge channel that directs flow back into the original stream.



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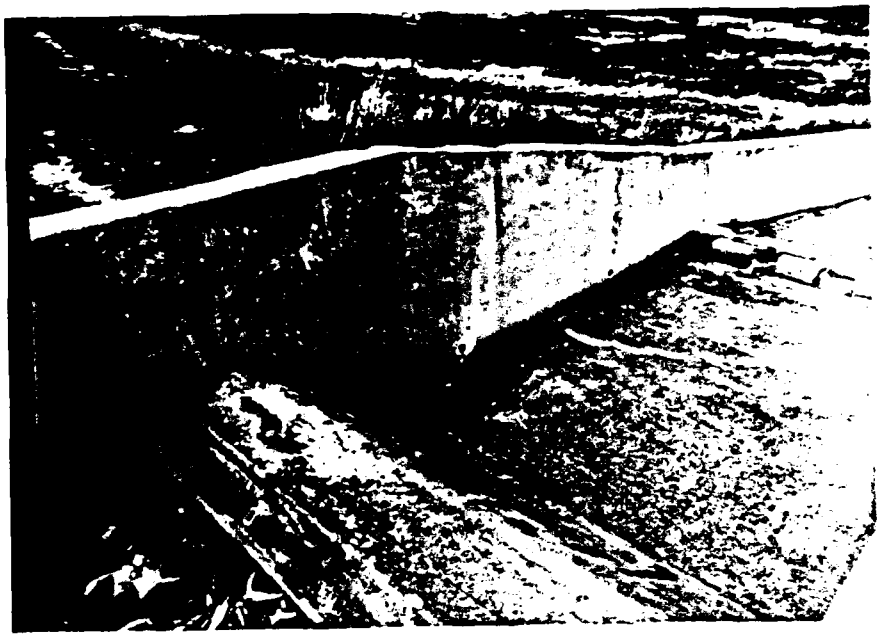

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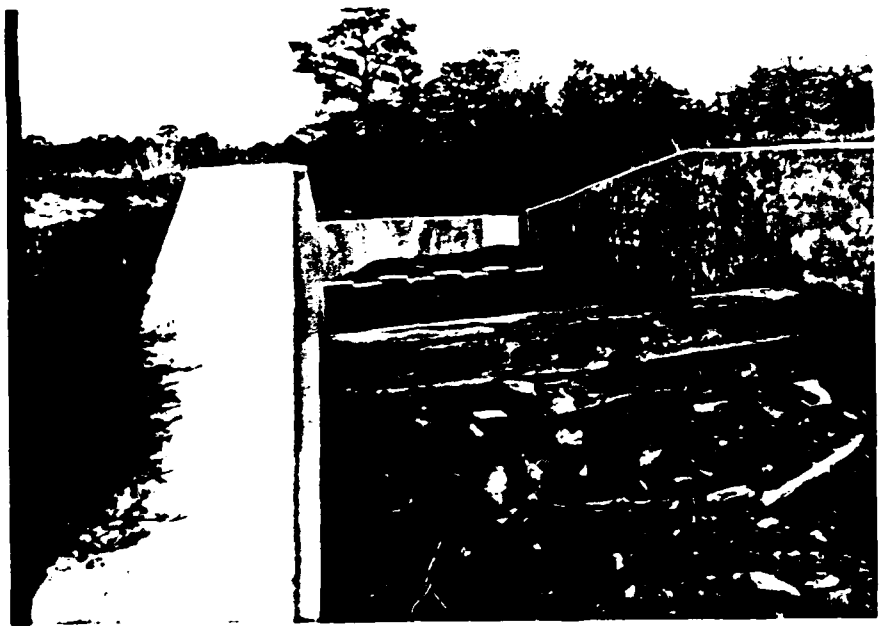

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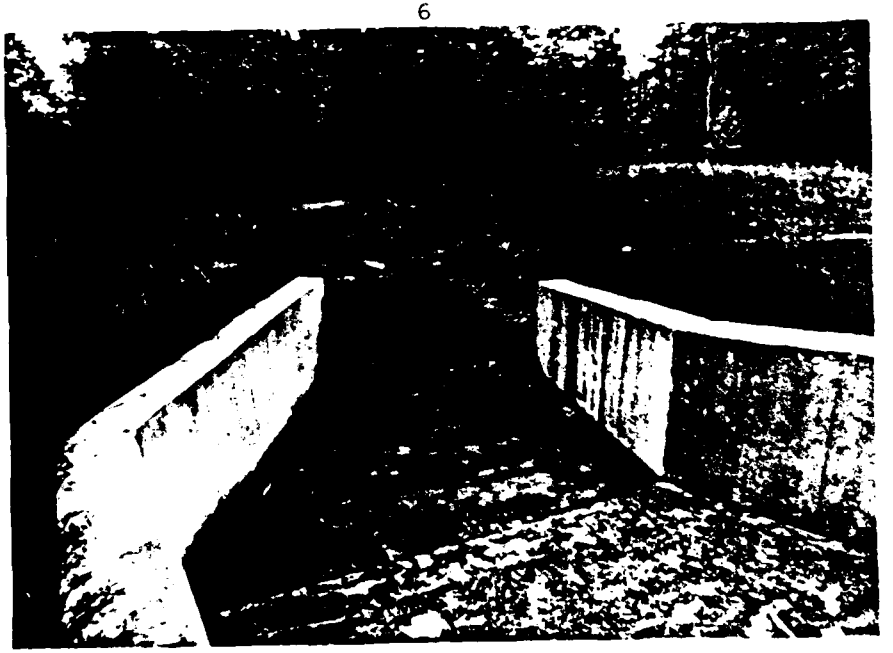

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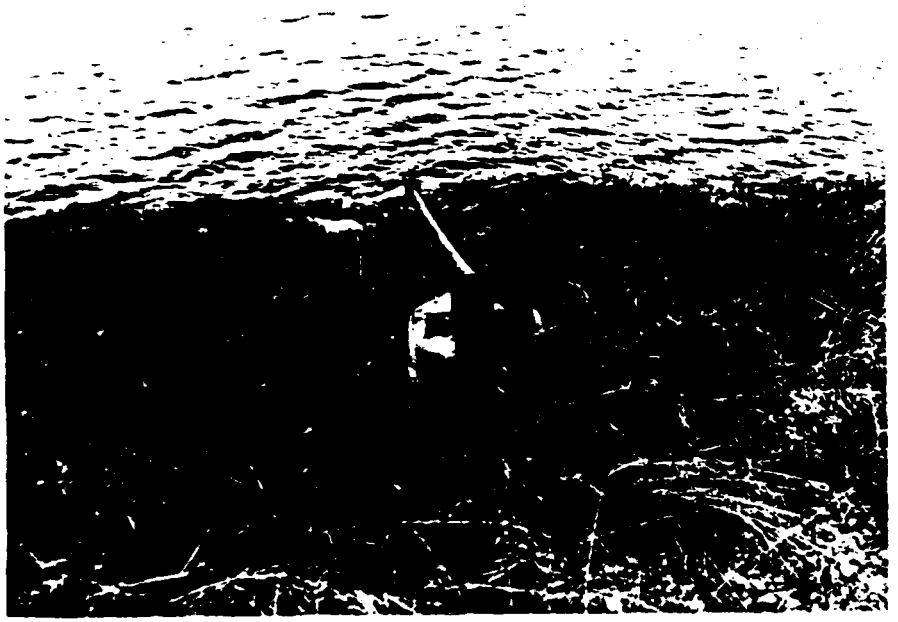
Photograph 9	View of the outlet conduit valve control mechanism located along the upstream embankment face to the right of the spillway.
Photograph 10	View of the concrete headwall at the discharge end of the outlet conduit.
Photograph 11	View of the wooded knoll situated immediately downstream of the embankment between the spillway and outlet conduit discharge channels.
Photograph 12	View of ponded water fed by seepage observed about 160 feet downstream of the outlet.



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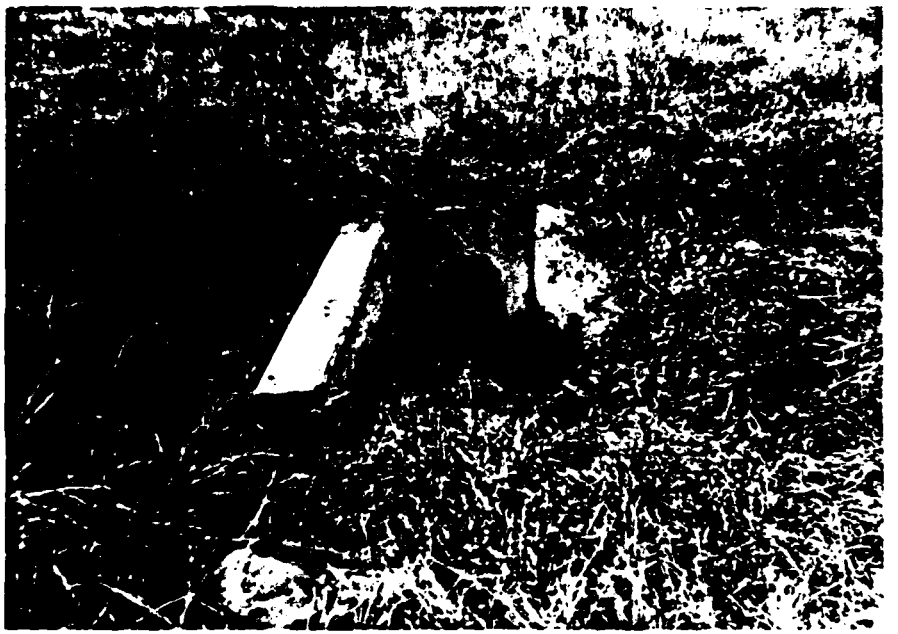

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APPENDIX D

HYDROLOGIC AND HYDRAULIC ANALYSES

PREFACE

The modified HEC-1 program is capable of performing two basic types of hydrologic analyses: 1) the evaluation of the overtopping potential of the dam; and 2) the estimation of the downstream hydrologic-hydraulic consequences resulting from assumed structural failures of the dam. Briefly, the computational procedures typically used in the dam overtopping analysis are as follows:

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir to determine if the event(s) analyzed would overtop the dam.

c. Routing of the outflow hydrograph(s) from the reservoir to desired downstream locations. The results provide the peak discharge(s), time(s) of occurrence the peak discharge(s), and the maximum stage(s) of each routed hydrograph at the downstream end of each reach.

The evaluation of the hydrologic-hydraulic consequences resulting from an assumed structural failure (breach) of the dam is typically performed as shown below.

a. Development of an inflow hydrograph(s) to the reservoir.

b. Routing of the inflow hydrograph(s) through the reservoir.

c. Development of a failure hydrograph(s) based on specified breach criteria and normal reservoir outflow.

d. Routing of the failure hydrograph(s) to desired downstream locations. The results provide estimates of the peak discharge(s), time(s) to peak and maximum water surface elevation(s) of failure hydrograph(s) for each location.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: POCONO MOUNTAIN LAKE DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.0 INCHES/24 HOURS (1)

STATION	1	2	3
STATION DESCRIPTION	Pocono Mountain Lake Dam		
DRAINAGE AREA (SQUARE MILES)	0.29		
CUMULATIVE DRAINAGE AREA (SQUARE MILES)	-		
ADJUSTMENT OF PMF FOR DRAINAGE AREA LOCATION (%) (1)	Zone 1		
6 HOURS	111		
12 HOURS	123		
24 HOURS	133		
48 HOURS	142		
72 HOURS	-		
SNYDER HYDROGRAPH PARAMETERS			
ZONE (2)	1		
C_p (3)	0.45		
C_t (3)	1.23		
L (MILES) (4)	1.0		
L_{ca} (MILES) (4)	0.4		
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (HOURS)	0.93		
SPILLWAY DATA			
CREST LENGTH (FEET)	16		
FREEBOARD (FEET)	4.6		

(1) HYDROMETEOROLOGICAL REPORT 33, U.S. ARMY CORPS OF ENGINEERS, 1956.
(2) HYDROLOGIC ZONE DEFINED BY CORPS OF ENGINEERS, BALTIMORE DISTRICT, FOR DETERMINATION OF SNYDER COEFFICIENTS (C_p AND C_t).
(3) SNYDER COEFFICIENTS
(4) L = LENGTH OF LONGEST WATERCOURSE FROM DAM TO BASIN DIVIDE
L_{ca} = LENGTH OF LONGEST WATERCOURSE FROM DAM TO POINT OPPOSITE BASIN CENTROID.

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-8-81 PROJ. NO. 80-238-767

CHKD. BY JRL DATE 2-12-81 SHEET NO. 1 OF 12

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DAM STATISTICS

HEIGHT OF DAM = 22 FEET (FIELD MEASURED: TOP OF DAM TO OUTLET INVERT; "TOP OF DAM" HERE AND ON ALL SUBSEQUENT CALCULATION SHEETS REFERS TO THE LOW SPOT IN THE EMBANKMENT CREST.)

NORMAL POOL STORAGE CAPACITY = 74 AC-FT (HEC-1)

MAXIMUM POOL STORAGE CAPACITY = 146 AC-FT (HEC-1)
(@ TOP OF DAM)

DRAINAGE AREA = 0.29 SQUARE MILES (PLANIMETERED ON USGS 7.5' TOPO QUAD - LAKE MASKENOZHA, PA)

ELEVATIONS:

TOP OF DAM (DESIGN)	= 1145.0	(FIG 3, SEE NOTE 1)
TOP OF DAM (FIELD)	= 1144.6	
NORMAL POOL	= 1140.0	(SEE NOTE 1)
SPILLWAY CREST	= 1140.0	
UPSTREAM INLET INVERT (DESIGN)	= 1123.0	(EST; FIG 5; SEE NOTE 1)
DOWNSTREAM OUTLET INVERT (DESIGN)	= 1123.0	(EST; FIG 5; SEE NOTE 1)
DOWNSTREAM OUTLET INVERT (FIELD)	= 1123.0	
STREAMBED @ DAM CENTERLINE	= 1123.0	(EST., FIG 5; SEE NOTE 1)

NOTE 1: THE DESIGN DRAWINGS ARE BASED ON A NORMAL POOL OR SPILLWAY CREST ELEVATION OF 966.0. HOWEVER, THE USGS TOPO QUAD FOR LAKE MASKENOZHA, PA, INDICATES THAT THE NORMAL POOL ELEVATION IS ON THE ORDER OF 1140.0. ALSO, IN COMPARING THE "GENERAL LOCATION PLAN" WITH THE "SITE PLAN" FOR THE PROPOSED DAM (BOTH ON FIG 2), ELEVATION 950.0 ON THE SITE PLAN (STREAMBED AT DAM CENTERLINE)

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CORRESPONDS APPROXIMATELY WITH ELEVATION 1120.0 ON THE GENERAL LOCATION PLAN. THUS, IT WILL BE ASSUMED THAT 170.0 FEET MUST BE ADDED TO ALL ELEVATIONS INDICATED ON THE SITE PLAN. IN ADDITION, IN COMPARING THE GENERAL LOCATION PLAN WITH THE USGS TOPO QUAD (FIG. 1), IT APPEARS THAT THE DAM WAS ACTUALLY CONSTRUCTED ABOUT 300 TO 400 FEET UPSTREAM FROM THE ORIGINAL DESIGN LOCATION. THEREFORE, FROM FIGURES 1 & 2, IT WILL BE ASSUMED THAT THE OUTLET INVERT (OR TOE OF THE DAM) IS APPROXIMATELY AT ELEVATION 1123.0, AS OPPOSED TO ELEVATION 1119.0. THUS, 174.0 FEET MUST BE ADDED TO ALL ELEVATIONS INDICATED ON THE DESIGN SKETCHES. IT MUST BE NOTED THAT THE ELEVATIONS USED HERE ARE CONSIDERED ESTIMATES, AND ARE NOT NECESSARILY ACCURATE.

DAM CLASSIFICATION

DAM SIZE: SMALL (REF 1, TABLE 1)

HAZARD CLASSIFICATION: HIGH (FIELD OBSERVATION)

REQUIRED SDF: ½ PMF TO PMF (REF 1, TABLE 3)

HYDROGRAPH PARAMETERS

- LENGTH OF LONGEST WATERCOURSE: $L = 1.0$ MILE
- LENGTH OF LONGEST WATERCOURSE FROM DAM TO A POINT OPPOSITE BASIN CENTROID: $L_{CA} = 0.4$ MILES
  (USGS TOPO QUAD - LAKE MASKENOZHA, PA)

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY RJS DATE 1-8-81 PROJ NO 80-238-767

CHKD BY JAL DATE 2-2-81 SHEET NO 2 OF 12

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$C_t = .83$
$C_p = .345$

(VALUES FOR COE ZONE 1, DELAWARE RIVER BASIN)

SNYDER'S STANDARD LAG: $t_p = C_t (L L_{CA})^{.3}$
$= .83 (3.34)^{.3}$
$= 2.93$ HOURS

(NOTE: HYDROGRAPH VARIABLES USED HERE ARE DEFINED IN REF 2, IN SECTION ENTITLED 'SNYDER SYNTHETIC UNIT HYDROGRAPH')

RESERVOIR CAPACITY

RESERVOIR SURFACE AREAS:

SURFACE AREA (SA) @ NORMAL POOL (EL. 1140.0) = 13 ACRES

SA @ ELEV. 1160.0 = 37 ACRES

(USGS TOPO QUAD - LAKE MINISINKA, PA)

S.A. @ TOP OF DAM (EL. 1144.6) = 185 ACRES

(BY LINEAR INTERPOLATION)

- THE "ZERO-STORAGE" ELEVATION IS ASSUMED TO BE AT ELEVATION 1123.0, OR THE DESIGN UPSTREAM INLET INVERT ELEVATION.

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-9-81 PROJ NO 80-238-767

CHKD BY JRL DATE 2-12-81 SHEET NO 4 OF 12

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ELEVATION - STORAGE RELATIONSHIP:

THE ELEVATION-STORAGE RELATIONSHIP IS COMPUTED INTERNALLY IN THE HEC-1 PROGRAM, BY USE OF THE CONIC METHOD, BASED ON THE ELEVATION-SURFACE AREA DATA GIVEN ABOVE. (SEE SUMMARY INPUT/OUTPUT SHEETS.)

PMP CALCULATIONS

- APPROXIMATE RAINFALL INDEX = 22.0 INCHES
  (CORRESPONDING TO A DURATION OF 24 HOURS AND A DRAINAGE AREA OF 200 SQUARE MILES.)

(REF. 3, FIG. 1)

- DEPTH-AREA-DURATION ZONE 1 (REF. 3, FIG. 1)

- ASSUME DATA CORRESPONDING TO A 10-SQUARE MILE AREA MAY BE APPLIED TO THIS 0.29-SQUARE MILE BASIN:

DURATION (HRS)	PERCENT OF INDEX RAINFALL	
6	111	
9	123	
24	133	
48	142	(REF 3, FIG 3)

HOP BROOK FACTOR (ADJUSTMENT FOR BASIN SHAPE AND FOR THE LESSER LIKELIHOOD OF A SEVERE STORM CENTERING OVER A SMALL BASIN) FOR A DRAINAGE AREA OF 0.29 SQUARE MILES IS 0.80.

(REF. 4, p. 48)

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

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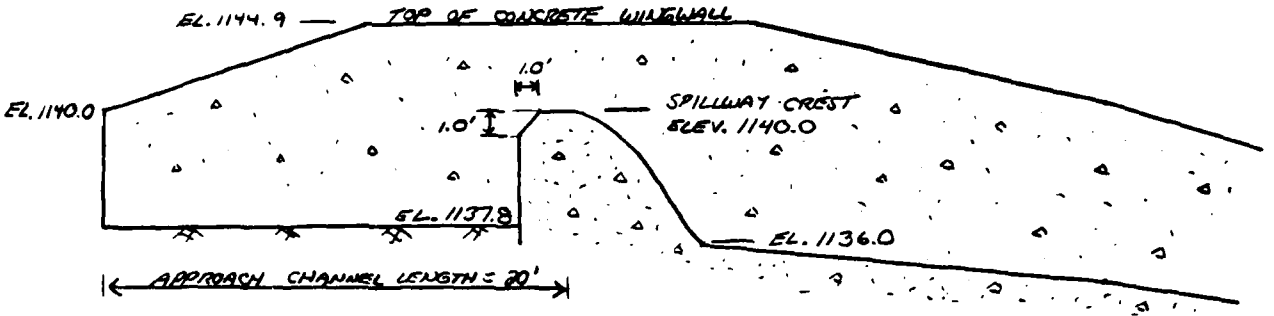
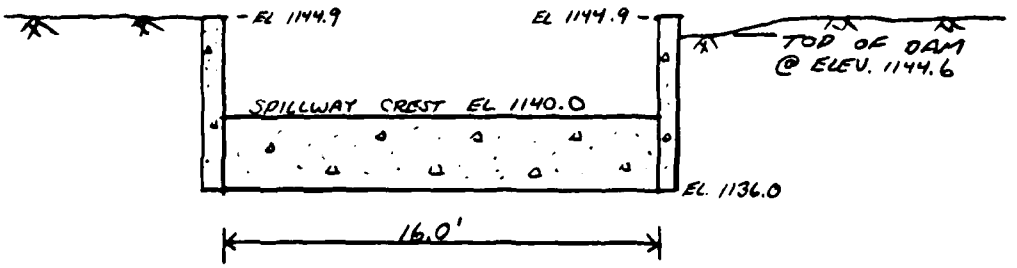
SPILLWAY CAPACITY

PROFILE:



- NOT TO SCALE -

CROSS-SECTION: (LOOKING UPSTREAM)



- NOT TO SCALE -

(SKETCHES BASED ON FIELD MEASUREMENTS AND DESIGN DRAWINGS - FIGS 3 AND 5).

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-9-81 PROJ. NO. 80-238-767

CHKD. BY JRL DATE 2-12-81 SHEET NO. 6 OF 12

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THE SPILLWAY CONSISTS OF A RECTANGULAR CONCRETE CHUTE CHANNEL WITH DISCHARGES REGULATED BY A CONCRETE OGEE-TYPE WEIR. DISCHARGE OVER THE WEIR CAN BE ESTIMATED BY THE RELATION

$$Q = CLH^{3/2} \qquad \text{(REF. 4, p. 373)}$$

WHERE Q = DISCHARGE OVER THE WEIR, IN CFS,
C = DISCHARGE COEFFICIENT,
L = LENGTH OF WEIR CREST = 16 FT,
H = TOTAL HEAD ON CREST, IN FT.

THE DESIGN HEAD, H_o, IS ASSUMED TO BE 5.0 FEET, OR TO THE DESIGN TOP OF DAM (SPILLWAY WINGWALLS). IT IS ASSUMED THAT THE RELATIONSHIPS IN REF. 4, pp. 372-382, ARE APPLICABLE TO THIS OGEE-TYPE WEIR. FOR A FOREBAY DEPTH OF 2.2 FEET,

$$\frac{P}{H_o} = \frac{2.2}{5.0} = 0.44$$

$$\therefore C_o = 3.77 \qquad \text{(REF. 4, FIG 249, p 378)}$$

APPROACH CHANNEL LOSSES @ DESIGN HEAD DISCHARGE:

- APPROACH CHANNEL LENGTH = 20 FT (FIELD MEASURED)
- APPROACH CHANNEL WIDTH = 16 FT
- AT EL. 1145.0 (DESIGN POOL),

AVERAGE APPROACH CHANNEL DEPTH = 5.0 + 2.2 = 7.2 FEET

FLOW AREA = 7.2 × 16.0 = 115.2 FT

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-9-81 PROJ. NO. 80-238-767

CHKD. BY WRL DATE 2-12-81 SHEET NO. 7 OF 12

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- INITIAL ESTIMATE OF DISCHARGE:

$$Q = CLH^{3/2} = (3.77)(16)(5^{3/2}) = \underline{674} \text{ CFS}$$

- AVERAGE VELOCITY IN APPROACH CHANNEL:

$$V_A = \frac{Q}{A} = \frac{674}{115.2} = \underline{5.9} \text{ FPS}$$

- AVERAGE APPROACH VELOCITY HEAD

$$h_a = \frac{V_a^2}{2g} = \frac{5.9^2}{64.4} = \underline{0.54} \text{ FT}$$

- ASSUMING THAT THE APPROACH CHANNEL ENTRANCE LOSS = $\underline{0.1\, h_a}$ (REF 4, p.379),

ENTRANCE LOSS = $0.1 \times 0.54 = \underline{0.05}$ FT

- APPROACH CHANNEL FRICTION LOSS, h_F:

$$h_F = \left[\frac{V_a\, n}{1.486\, R^{2/3}}\right]^2 \times L_c \qquad \text{(REF 4, p.379)}$$

WHERE L_c = LENGTH OF APPROACH CHANNEL = 20 FT,
n = MANNINGS ROUGHNESS COEFFICIENT = 0.040,
(COMPOSITE; FIELD OBSERVATION)
R = HYDRAULIC RADIUS = FLOW AREA / WETTED PERIMETER.

WETTED PERIMETER:

$$\text{AVG. HT. OF WINGWALL} = \frac{(7.1)(7.5) + \left(\frac{7.1+2.2}{2}\right)(12.5)}{20}$$

$$= \underline{5.6 \text{ FT}}$$

∴ AVG. WETTED PERIMETER = $2(5.6) + 16 = \underline{27.2}$ FT

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-12-81 PROJ. NO. 80-238-767

CHKD. BY JRL DATE 2-12-81 SHEET NO. 8 OF 12

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AVG. HYDRAULIC RADIUS = $R_H = \frac{A}{P} = \frac{115.2}{27.2} = 4.2$ FT

$\therefore h_F = \left[\frac{(5.9)(0.040)}{(1.486)(4.2)^{2/3}}\right]^2 \times 20 = 0.07$ FT

$\therefore$ TOTAL APPROACH CHANNEL LOSS = 0.07 + 0.05 = 0.12 FT

- ACTUAL EFFECTIVE HEAD $H_E = 5.0 - 0.12 = 4.88$ FT

SPILLWAY CAPACITY AT DESIGN HEAD = $(3.77)(16)(4.88^{3/2})$
= 650 CFS

- FOR HEADS OTHER THAN DESIGN HEAD, THE APPROACH CHANNEL LOSSES WILL BE ASSUMED TO BE PROPORTIONAL TO THE LOSSES AT DESIGN HEAD:

$$h_L = \left(\frac{0.12}{5.0}\right) H$$

WHERE h_L = APPROACH CHANNEL LOSS, IN FT, AND
H = RESERVOIR ELEVATION − 1140.0 FT.

EFFECTS OF HEAD OTHER THAN DESIGN HEAD:

AS THE HEAD ON THE WEIR BECOMES SMALL, DISCHARGE IS REDUCED DISPROPORTIONATELY, DUE TO THE ROUGHNESS AND THE CONTACT PRESSURE BETWEEN THE WATER AND THE WEIR SURFACE. THUS, THE DISCHARGE COEFFICIENT (c) TAKES ON A VALUE LOWER THAN THAT OF DESIGN HEAD. THE OPPOSITE TREND OCCURS FOR HEADS GREATER THAN THAT OF DESIGN. THEREFORE, THE DESIGN DISCHARGE COEFFICIENT WILL BE MODIFIED APPROPRIATELY, ACCORDING TO FIG. 250, REF. 4.

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY JSS DATE 1-12-81 PROJ. NO. 80-238-767

CHKD. BY JEL DATE 2-12-81 SHEET NO. 9 OF 12

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SPILLWAY RATING TABLE

RESERVOIR ELEVATION (FT)	H (FT)	H/H_o ①	C/C_o ②	C ③	ESTIMATED APPROACH LOSS, H_L (FT) ④	EFFECTIVE HEAD, H_E (FT) ⑤	Q ⑥ (CFS)
1140.0	0	—	—	—	—	—	0
1141.0	1.0	0.20	0.85	3.20	0.02	0.98	50
1142.0	2.0	0.40	0.90	3.39	0.05	1.95	150
1143.0	3.0	0.60	0.94	3.54	0.07	2.93	280
1144.0	4.0	0.80	0.97	3.66	0.10	3.90	450
(TOP OF DAM) 1144.6	4.6	0.92	0.99	3.73	0.11	4.49	570
(TOP OF SPILLWAY WINGWALLS) 1144.9	4.9	0.98	1.00	3.77	0.12	4.78	630
1145.0	5.0	1.00	1.00	3.77	0.12	4.88	650
1145.3	5.3	1.06	1.01	3.81	0.13	5.17	720
1145.5	5.5	1.10	1.02	3.85	0.13	5.37	770
1146.0	6.0	1.20	1.02	3.85	0.14	5.86	870
1146.5	6.5	1.30	1.04	3.92	0.16	6.34	1000
1147.0	7.0	1.40	1.05	3.96	0.17	6.83	1130
1148.0	8.0	1.60	1.07	4.03	0.19	7.81	1410

① H_o = DESIGN HEAD = 5.0 FT

② C/C_o : FROM REF 4, FIG. 250, p. 378.

③ $C_o = 3.77$; $C = 3.77 \times C/C_o$

④ $h_L = \left(\frac{0.12}{5.0}\right) H$ (SEE SHEET 8)

⑤ $H_E = H - h_L$

⑥ $Q = C L H_E^{3/2}$; $L = 16$ FT ; (COMPUTED TO NEAREST 10 CFS).

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-12-81 PROJ. NO. 80-238-767

CHKD. BY JHL DATE 2-12-81 SHEET NO. 10 OF 12

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EMBANKMENT RATING CURVE

ASSUME THAT THE EMBANKMENT BEHAVES ESSENTIALLY AS A BROAD-CRESTED WEIR WHEN OVERTOPPING OCCURS. THUS, THE DISCHARGE CAN BE ESTIMATED BY THE RELATIONSHIP

$$Q = CLH^{3/2} \qquad \text{(REF 5, p. 5-23)}$$

WHERE Q = DISCHARGE OVER EMBANKMENT, IN CFS,
L = LENGTH OF EMBANKMENT OVERTOPPED, IN FT,
H = HEAD, IN FT; IN THIS CASE IT IS THE AVERAGE "FLOW AREA WEIGHTED" HEAD ABOVE THE LOW TOP OF DAM,
C = COEFFICIENT OF DISCHARGE; DEPENDENT UPON THE HEAD AND THE WEIR BREADTH.

LENGTH OF EMBANKMENT INUNDATED VS RESERVOIR ELEVATION:

ELEVATION (FT)	LENGTH (FT)
1144.6	0
1144.9	40
1145.1	100
1145.2	170
1145.3	350
1145.4	640
1145.6	860
1146.0	940
1146.5	950
1147.0	950
1148.0	960

(FROM FIELD SURVEY AND FIG. 2; SIDE-SLOPES: RIGHT ABUTMENT – 7H:1V LEFT ABUTMENT – 5H:1V)

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-12-81 PROJ. NO. 80-238-767

CHKD. BY JRL DATE 2-12-81 SHEET NO. 11 OF 12

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ASSUME THAT INCREMENTAL DISCHARGES OVER THE EMBANKMENT FOR SUCCESSIVE RESERVOIR ELEVATIONS ARE APPROXIMATELY TRAPEZOIDAL IN CROSS-SECTIONAL FLOW AREA. THEN ANY INCREMENTAL AREA OF FLOW CAN BE ESTIMATED AS $H_i[(L_1+L_2)/2]$, WHERE L_1 = LENGTH OF EMBANKMENT OVERTOPPED AT HIGHER ELEVATION, L_2 = LENGTH AT LOWER ELEVATION, AND H_i = DIFFERENCE IN ELEVATIONS. THUS, THE TOTAL AVERAGE "FLOW-AREA WEIGHTED" HEAD CAN BE ESTIMATED AS H_w = (TOTAL FLOW AREA / L_1).

EMBANKMENT RATING TABLE:

RESERVOIR ELEVATION (FT)	L_1 (FT)	L_2 (FT)	INCREMENTAL HEAD, H_i (FT)	① INCREMENTAL FLOW AREA, A_i (FT^2)	TOTAL FLOW AREA, A_T (FT^2)	② WEIGHTED HEAD, H_w (FT)	③ H_w/l	④ C	⑤ Q (CFS)
1144.6	0	—	—	—	—	—	—	—	0
1144.9	40	0	0.3	6	6	0.15	0.01	2.95	10
1145.1	100	40	0.2	14	20	0.20	0.01	2.97	30
1145.2	170	100	0.1	14	34	0.20	0.01	2.97	40
1145.3	350	170	0.1	26	60	0.17	0.01	2.96	70
1145.4	640	350	0.1	50	110	0.17	0.01	2.96	130
1145.6	860	640	0.2	150	260	0.30	0.02	2.99	420
1146.0	940	860	0.4	360	620	0.66	0.05	3.03	1520
1146.5	950	940	0.5	473	1093	1.15	0.08	3.04	3560
1147.0	950	950	0.5	475	1568	1.65	0.12	3.04	6120
1148.0	960	950	1.0	955	2523	2.63	0.19	3.07	12,550

① $A_i = H_i[(L_1+L_2)/2]$
② $H_w = A_T/L_1$
③ l = BREADTH OF CREST = 14 FT
④ $C = f(H, l)$; FROM REF 12, FIG. 24
⑤ $Q = CL_1H_w^{3/2}$ (TO NEAREST 10 CFS)

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM

BY DJS DATE 1-12-81 PROJ. NO. 80-238-767

CHKD. BY JRL DATE 2-12-81 SHEET NO. 12 OF 12

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TOTAL FACILITY RATING TABLE

$Q_{TOTAL} = Q_{SPILLWAY} + Q_{EMBANKMENT}$

	RESERVOIR ELEVATION (FT)	① $Q_{SPILLWAY}$ (CFS)	② $Q_{EMBANKMENT}$ (CFS)	Q_{TOTAL} (CFS)
	1140.0	0	—	0
	1141.0	50	—	50
	1142.0	150	—	150
	1143.0	280	—	280
	1144.0	450	—	450
(TOP OF DAM)	1144.6	570	0	570
(TOP OF SPILLWAY SIDEWALLS)	1144.9	630	10	640
	1145.1	670*	30	700
	1145.3	720	70	790
	1145.4	750*	130	880
	1145.6	790*	420	1210
	1146.0	870	1520	2390
	1146.5	1000	3560	4560
	1147.0	1130	6120	7250
	1148.0	1410	12,550	13,960

* - BY LINEAR INTERPOLATION

① FROM SHEET 9.
② FROM SHEET 11.

(NOTE: THE WATERSHED DIVIDE IN THE AREA JUST SOUTH OF THE UPSTREAM END OF THE RESERVOIR IS SOMEWHERE BETWEEN ELEVATIONS 1140.0 AND 1160.0. ALTHOUGH THE EXACT ELEVATION IS NOT KNOWN, IT IS ASSUMED IN THIS ANALYSIS THAT NO WATER IS LOST TO THE ADJACENT WATERSHED.)

OVERTOPPING ANALYSIS

DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM.**** OVERTOPPING ANALYSIS ****
10-MINUTE TIME STEP AND 48-HOUR STORM DURATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
288	0	10	0	0	0	0	0	0	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 4 LRTIO= 1

RTIOS= .40 .50 .60 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

RESERVOIR INFLOW

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	.29	0.00	.29	0.00	0.000	0	1	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.00	22.00	111.00	123.00	133.00	142.00	0.00	0.00

TRSPC COMPUTED BY THE PROGRAM IS .800

INITIAL AND CONSTANT RAINFALL LOSSES, AS PER C.O.E.

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.05	0.00	0.00

UNIT HYDROGRAPH DATA
TP= .93 CP= .45 NTA= 0

BASE FLOW PARAMETERS, AS PER C.O.E.

RECESSION DATA
STRTQ= -1.50 QRCSN= -.05 RTIOR= 2.00

APPROXIMATE CLARK COEFFICIENTS FROM GIVEN SNYDER CP AND TP ARE TC= 5.82 AND R= 8.95 INTERVALS

UNIT HYDROGRAPH 51 END-OF-PERIOD ORDINATES. LAG= .93 HOURS, CP= .45 VOL= 1.00

6.	27.	45.	66.	85.	90.	85.	76.	68.	61.
55.	49.	44.	39.	35.	31.	28.	25.	22.	20.
18.	16.	14.	13.	11.	10.	9.	8.	7.	7.
6.	5.	5.	4.	4.	3.	3.	3.	2.	2.
2.	2.	2.	1.	1.	1.	1.	1.	1.	1.
1.									

END-OF-PERIOD FLOW

O						MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q

SUBJECT DAM SAFETY INSPECTION
POCONO MOUNTAIN LAKE DAM
BY DJS DATE 2-25-81 PROJ. NO. 80-238-767
CHKD. BY DLB DATE 2-25-81 SHEET NO. A OF C

SUMMARY INPUT/OUTPUT SHEETS

CONSULTA
Engineers • Geologists • Environmental Specialists

SUBJECT DAM SAFETY INSPECTION

POCONO MOUNTAIN LAKE DAM

BY RJT DATE 2-25-81 PROJ. NO. 80-238-767

CHKD. BY DLA DATE 2-25-81 SHEET NO. 8 OF C

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RESERVOIR INFLOW HYDROGRAPHS

0.5PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	436.	261.	85.	43.	12467.
CMS	12.	7.	2.	1.	353.
INCHES		8.37	10.91	11.11	11.11
MM		212.68	277.13	282.15	282.15
AC-FT		129.	169.	172.	172.
THOUS CU M		160.	208.	212.	212.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	871.	522.	170.	87.	24933.
CMS	25.	15.	5.	2.	706.
INCHES		16.75	21.82	22.22	22.22
MM		425.36	554.26	564.30	564.30
AC-FT		259.	337.	343.	343.
THOUS CU M		319.	416.	424.	424.

HYDROGRAPH ROUTING

ROUTE THROUGH RESERVOIR

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
101	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1140.	-1

STAGE	1140.00	1141.00	1142.00	1143.00	1144.00	1144.60	1144.90	1145.10	1145.30
	1145.60	1146.00	1146.50	1147.00	1148.00				
FLOW	0.00	50.00	150.00	280.00	450.00	570.00	640.00	700.00	790.00
	1210.00	2390.00	4560.00	7250.00	13960.00				
SURFACE AREA=	0.	13.	19.	37.					
CAPACITY=	0.	74.	146.	565.					
ELEVATION=	1123.	1140.	1145.	1160.					

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
1140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
1144.6	0.0	0.0	0.

SUBJECT DAM SAFETY INSPECTION

Poono Mountain Lake Dam

BY DTS DATE 2-25-81 PROJ. NO. 80-238-767

CHKD. BY DLA DATE 2-25-81 SHEET NO. 5 OF 5

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RESERVOIR OUTFLOW HYDROGRAPHS

0.5 PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	318.	234.	79.	40.	11493.
CMS	9.	7.	2.	1.	325.
INCHES		7.51	10.08	10.24	10.24
MM		190.85	256.03	260.11	260.11
AC-FT		116.	156.	158.	158.
THOUS CU M		143.	192.	195.	195.

PMF

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	687.	484.	161.	82.	23550.
CMS	19.	14.	5.	2.	667.
INCHES		15.54	20.66	20.98	20.98
MM		394.69	524.84	532.98	532.98
AC-FT		240.	319.	324.	324.
THOUS CU M		296.	394.	400.	400.

(OVERTOPPING OCCURS @ ≈ 0.84 PMF)

SUMMARY OF DAM SAFETY ANALYSIS

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1140.00	1140.00	1144.60
STORAGE	74.	74.	146.
OUTFLOW	0.	0.	510.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.40	1142.75	0.00	114.	248.	0.00	42.00	0.00
.50	1143.23	0.00	122.	318.	0.00	41.83	0.00
.60	1143.64	0.00	129.	389.	0.00	41.83	0.00
1.00	1145.06	.46	154.	667.	2.17	41.50	0.00

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APPENDIX E

FIGURES

LIST OF FIGURES

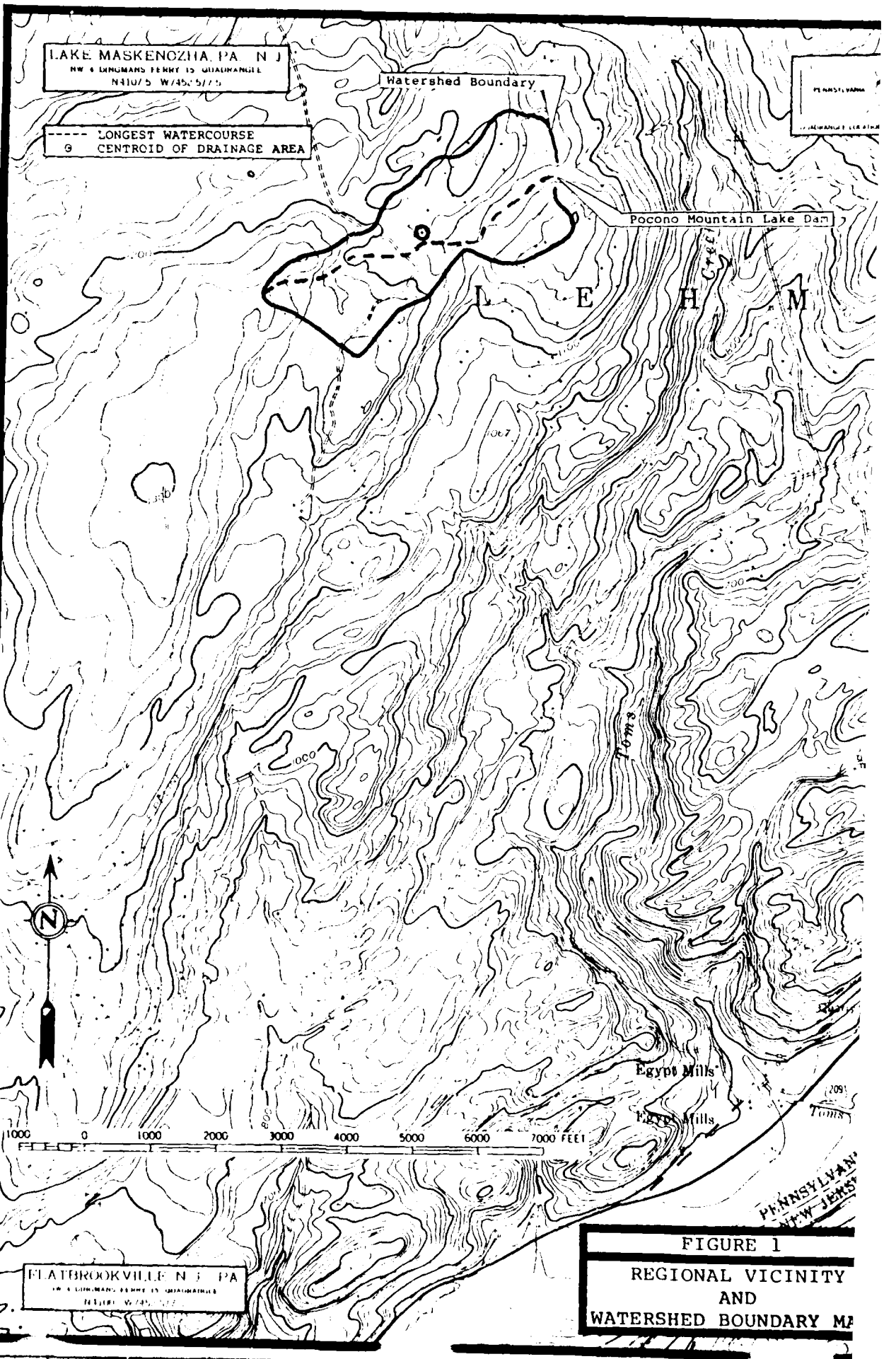

FIGURE 1

REGIONAL VICINITY
AND
WATERSHED BOUNDARY MA

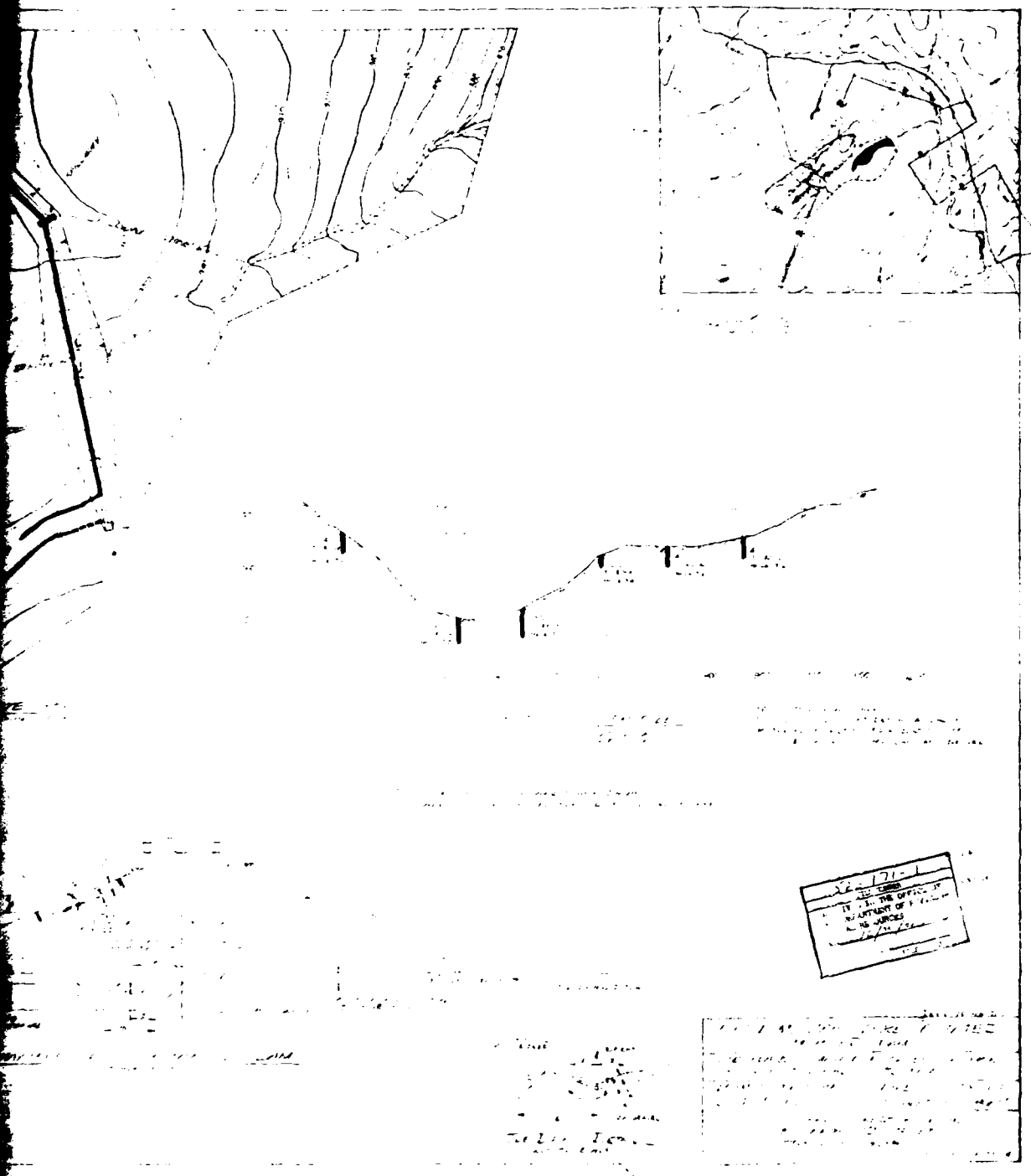

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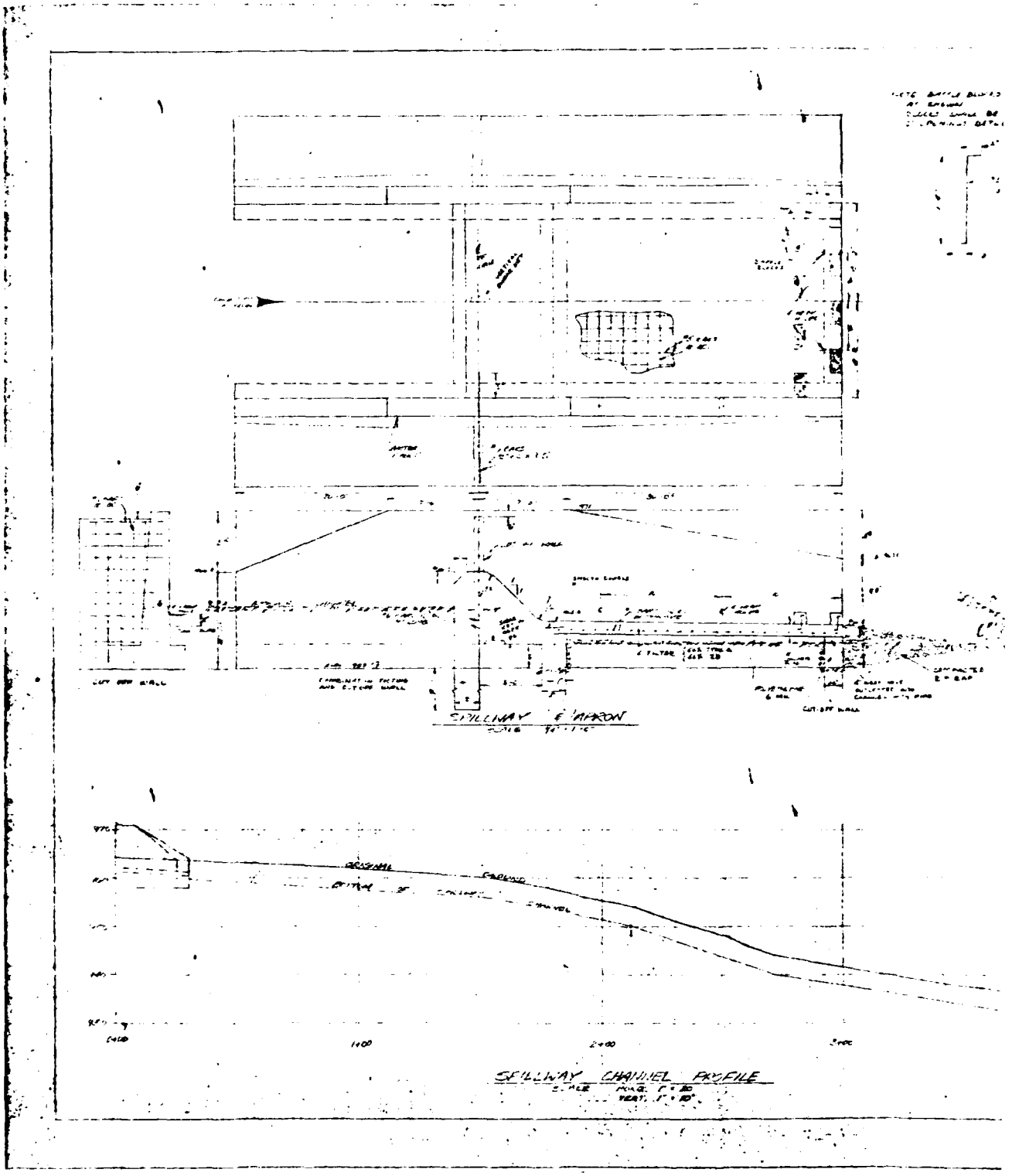
FIGURE 2


SPILLWAY & APRON
SPILLWAY CHANNEL PROFILE

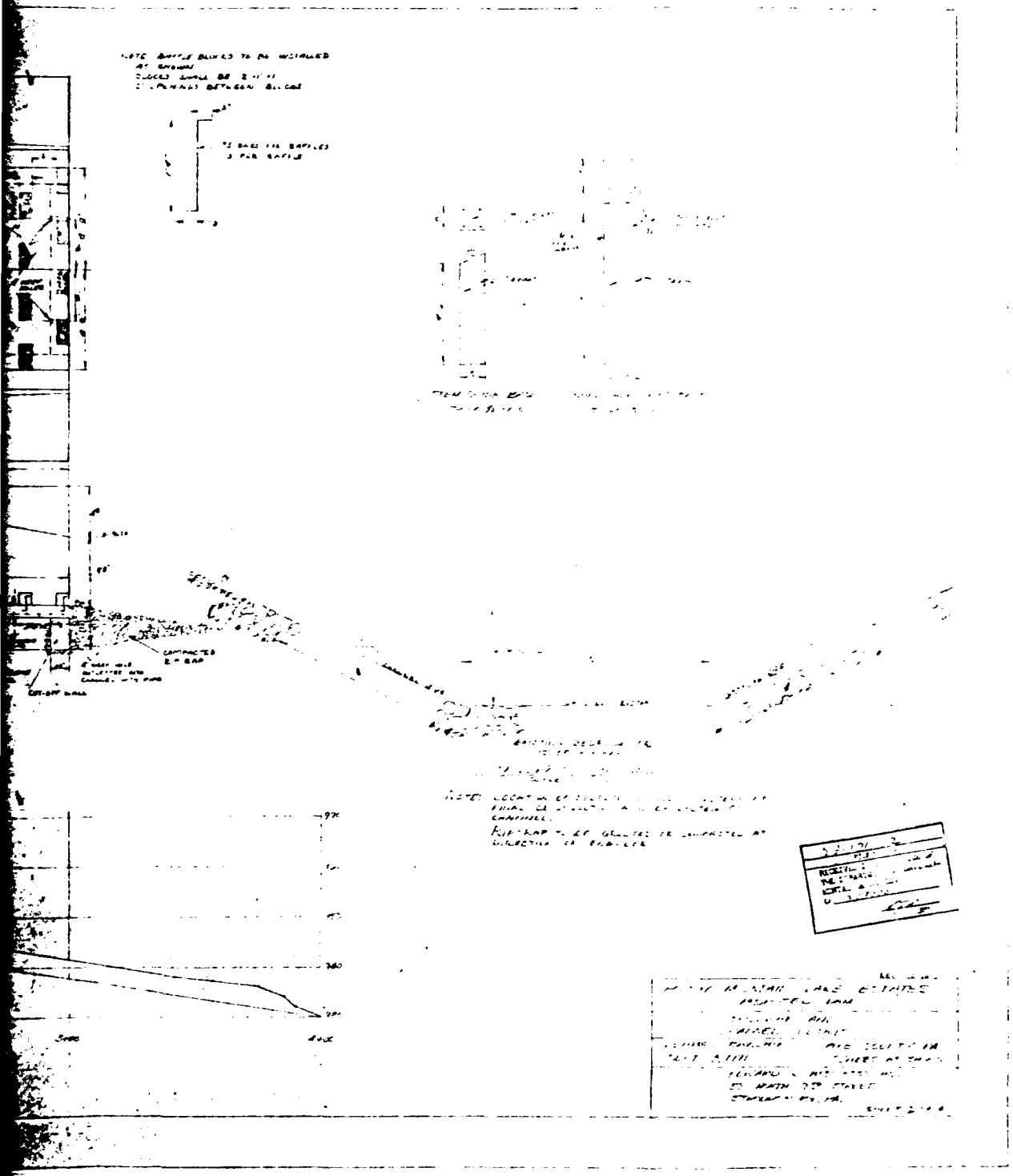


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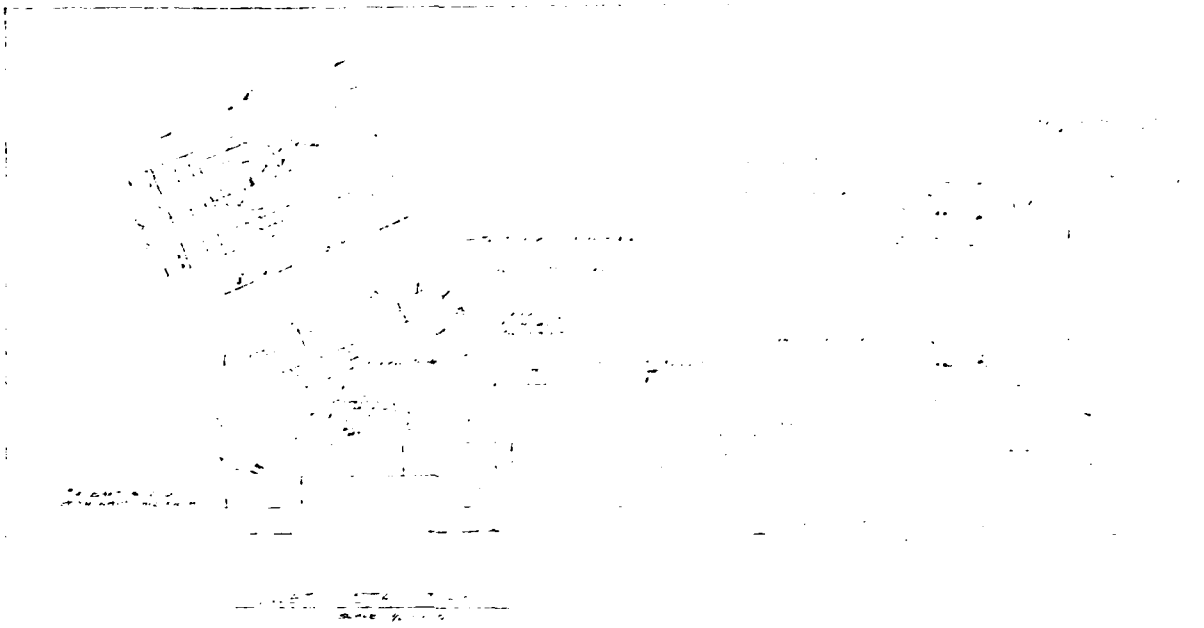
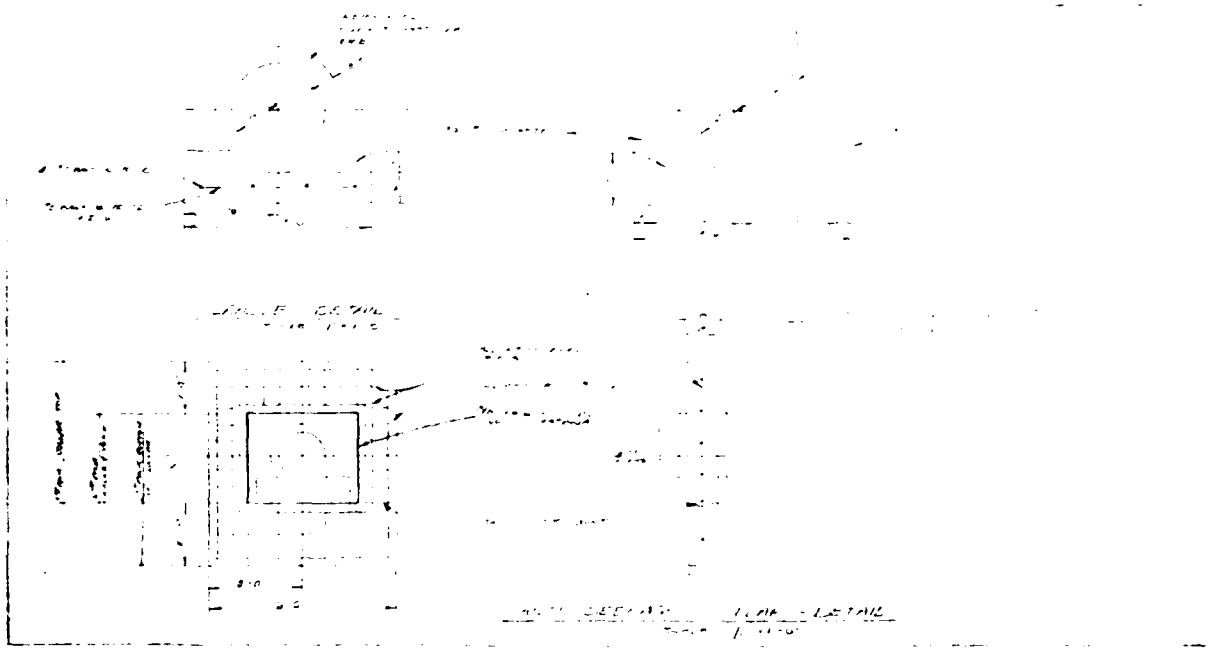
FIGURE 3





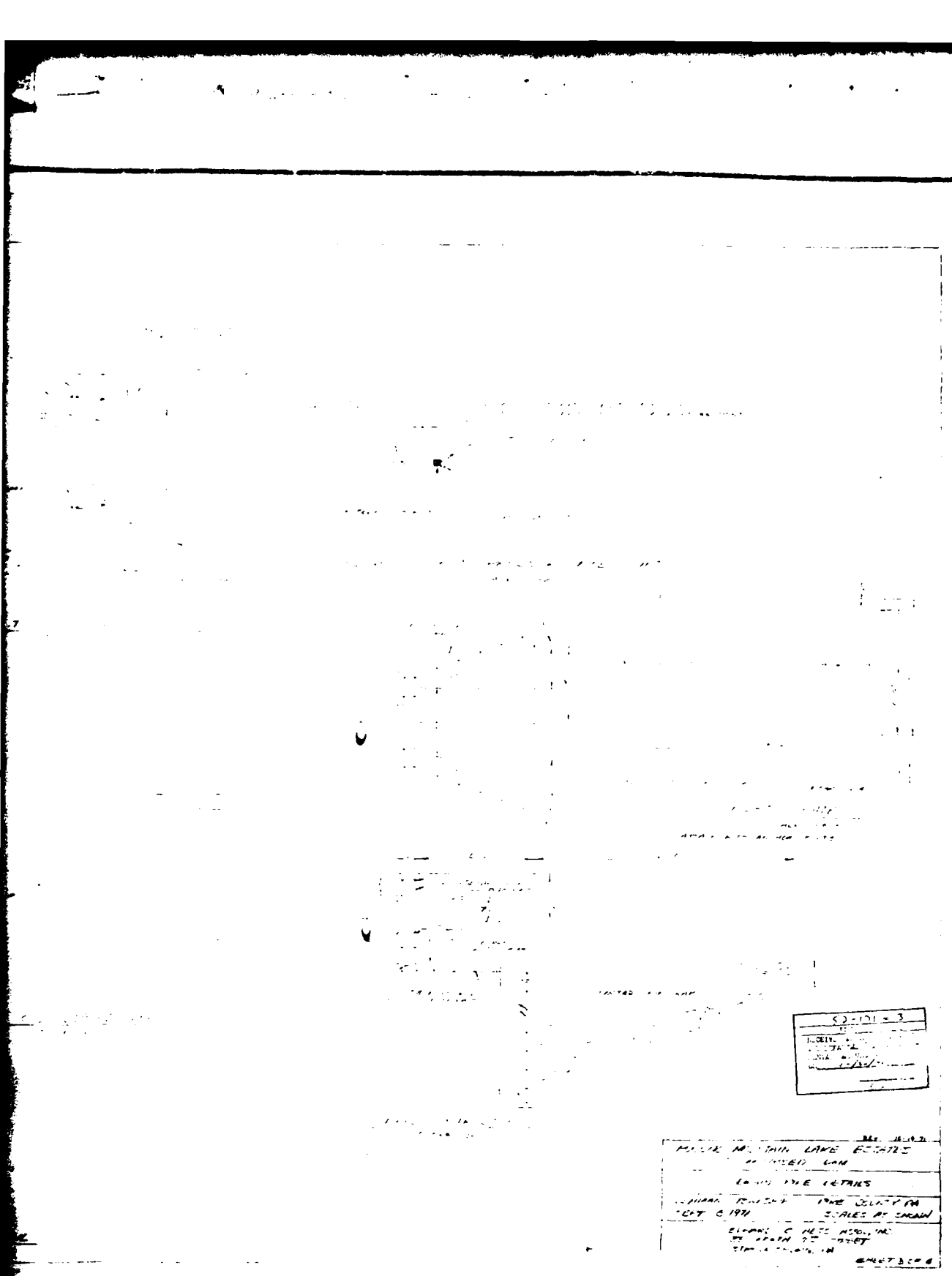


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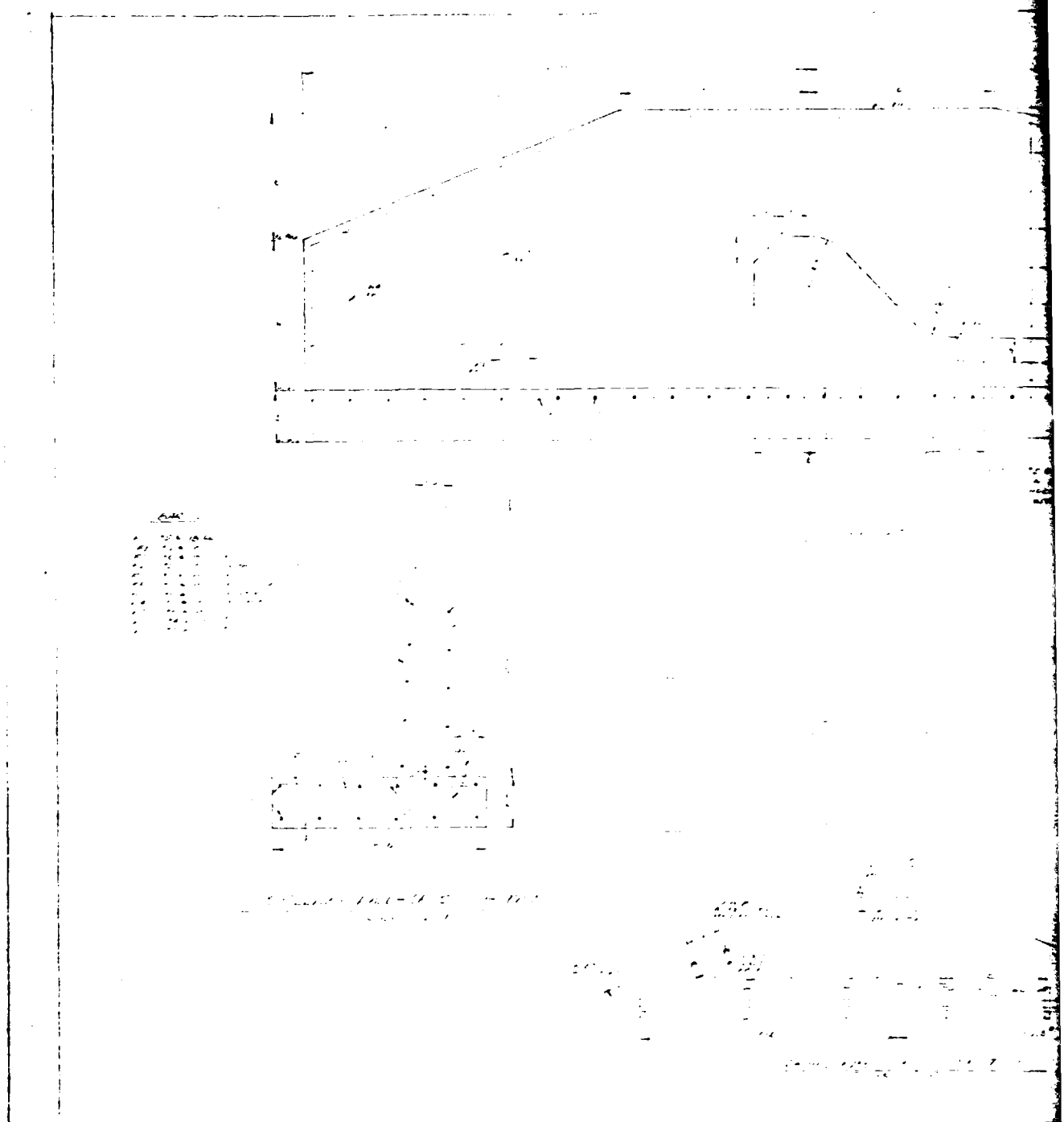
FIGURE 4



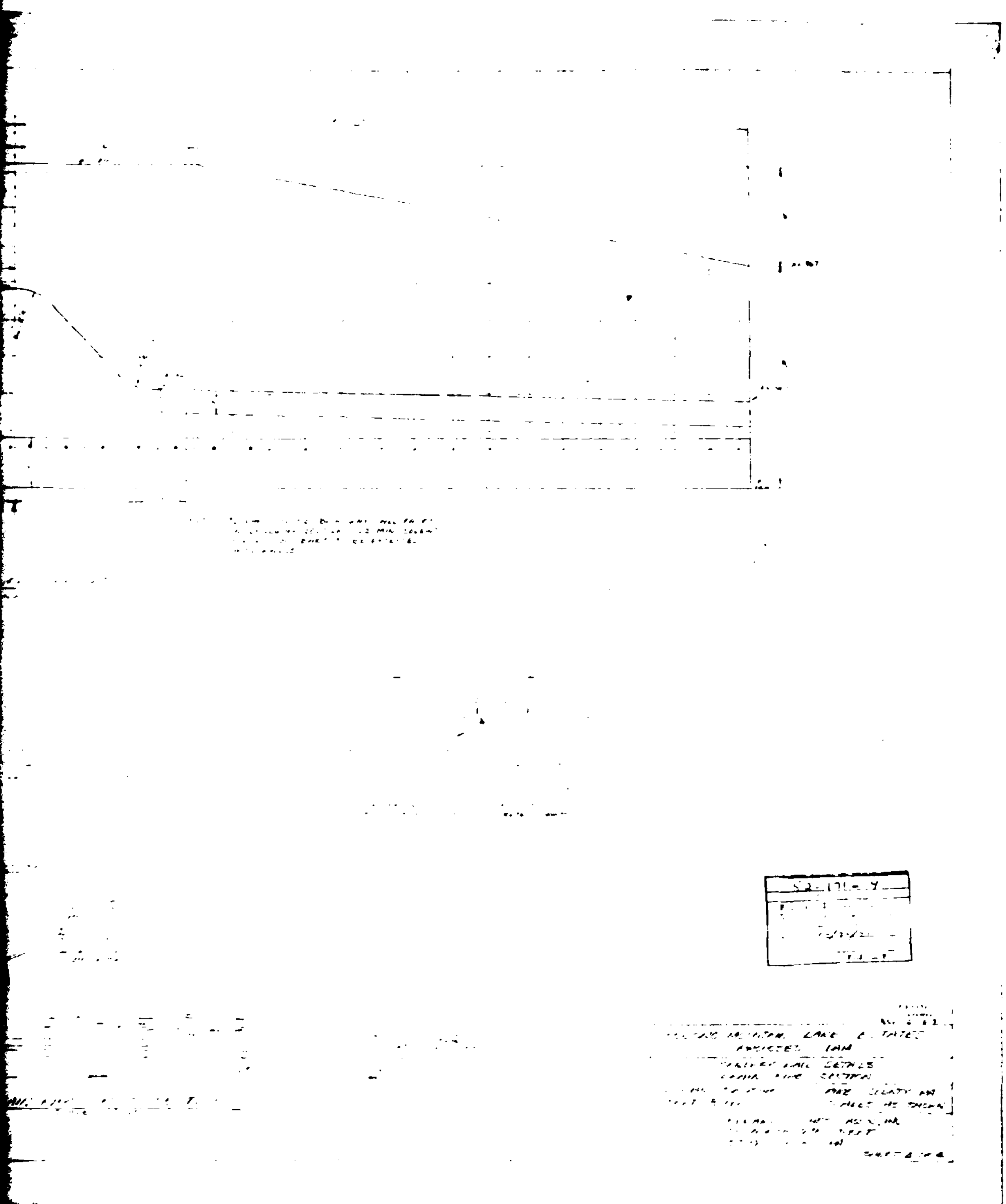


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FIGURE 5

APPENDIX F

GEOLOGY

Geology

Pocono Mountain Lake Dam is located in the glaciated Low Plateaus section of the Appalachian Plateaus physiographic province of eastern Pennsylvania. In this area, the Appalachian Plateaus province is characterized topographically by flat-topped, hummocky hills formed as a result of glaciation and subsequent stream dissection of nearly flat-lying strata. The Devonian age sedimentary rock strata in Pike County regionally strike N35°E and dip gently to the northwest. The Delaware River is the major drainage basin in the area. Major tributary streams intersect the Delaware River at right angles; whereas, smaller streams display a slightly more random tributary pattern. Both major and minor tributary stream systems are joint controlled and exhibit modified rectangular and trellis-type drainage patterns.

Structurally, the area containing Pike County lies on the south flank of a broad, asymmetrical synclinorium that plunges to the southwest. Superimposed on this broad structural basin are numerous anticlinal and synclinal folds characterized by planar limbs and narrow hinges. Due to prior glaciation, low relief and surficial soil cover, fold axes are difficult to trace.

The sedimentary rock sequences in the vicinity of the dam and reservoir are probably members of the Susquehanna Group of Upper Devonian age (see Geology Map). The sedimentological changes observed in the Catskill Formation indicate that the rate of sedimentation exceeded the rate of basin subsidence resulting in a facies change from marine to non-marine strata. On the accompanying geology map the delineation between the Middle and Upper Devonian age sedimentary rock sequences represents the Allegheny Front which separates the Valley and Ridge physiographic province from the Appalachian Plateaus physiographic province.

Approximately half of Pike County, including the dam site, is covered by a blanket of Wisconsin age (most recent) glacial drift which, based on the degree of weathering, was probably deposited during the Woodfordian stage. Valley bottoms are typically covered by recent alluvium and Woodfordian outwash of variable thickness, but typically less than 10 feet. These deposits are characteristically unconsolidated stratified sand and gravel usually with more gravel than sand and some small boulders. The direction of the Wisconsin ice advance, was from the northeast over the Catskill Mountains and from the north over the Appalachian Plateau. The terminal moraine resulting from the southern most advance of the Wisconsin ice sheet in this area is located in the southern portion of Monroe County which borders Pike County to the South.

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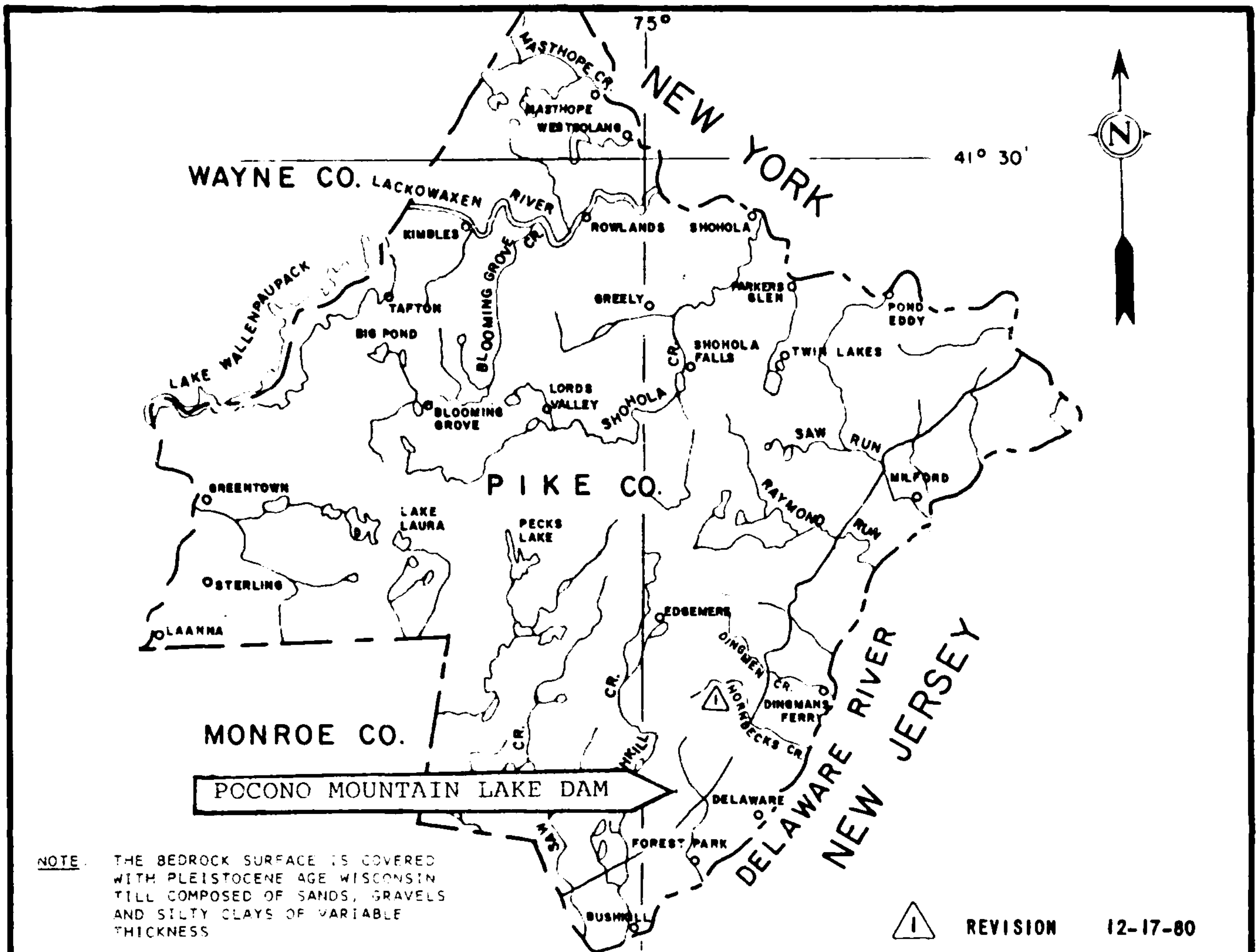

NOTE. THE BEDROCK SURFACE IS COVERED WITH PLEISTOCENE AGE WISCONSIN TILL COMPOSED OF SANDS, GRAVELS AND SILTY CLAYS OF VARIABLE THICKNESS

LEGEND

UPPER DEVONIAN — SUSQUEHANNA GROUP

Catskill Formation – *Shohola Member interbedded 5- to 25-foot thick units of greenish-gray and grayish-red very fine- to medium-grained sandstone and sandy shale and lesser medium-gray to medium-dark-gray sandstone and shale. Sandstones are predominantly low-rank graywackes. Beds are thin to very thick and most have simple or planar sets of small- to medium-scale, generally low-angle cross stratification. Contacts with shale units are abruptly disconformable to gradational. Sandstones are poorly cleaved. Shale is thinly laminated and well cleaved. Mud cracks, convolute bedding, and sole marks are present near contacts with sandstone units. Member is more than 2,000 feet thick. Lower contact is gradational and is placed at top of highest red bed of the underlying Analomink. Analomink Red Shale Member, medium-grayish red silty, micaceous, finely laminated well-cleaved shale containing thin beds of brownish-gray sandy siltstone and silty very fine grained sandstone. Unit is the "first red" going up section in Upper Devonian sequence. Member is about 100 feet thick. Lower contact is gradational and is placed at the base of lowest red bed. Delaware River Flags Member, grayish-green, micaceous, laminated sandstone and lesser interbedded sandy shale. Beds range from a few inches to as much as 4 feet thick. Sandstones are low-rank graywackes and contain no marine fossils. Member is about 330 feet thick. Lower contact is gradational.*

MIDDLE DEVONIAN — HAMILTON GROUP

Mahantango Formation – *Upper member medium-dark-gray, fairly coarse grained, thin-bedded siltstone and silty shale, member is about [illegible] feet thick and is separated from lower member by the "Centerfield Reef," a calcareous siltstone biostrome containing abundant horn corals. The Centerfield is about [illegible] feet thick, lower member, virtually same lithology as upper member. Unit is about 1,100 feet thick. Lower contact is gradational*

Marcellus Shale – *dark-gray, evenly laminated, silty clay shale and clayey silt shale. Unit commonly contains very hard lime concretions and is well cleaved; bedding is generally obscured. Member is about 25-feet thick. Lower contact is gradational.*

SCALE

0 6 12 18 MILES

REFERENCE
GEOLOGIC MAP OF NORTHEASTERN PENNSYLVANIA. COMPILED BY GEO. W. STOSE AND O.A. LJUNGSTEDT COMMONWEALTH OF PENNSLYVANIA DEPT. OF INTERNAL AFFAIRS DATED 1932, SCALE 1" = 6 MILES

GEOLOGY MAP

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DATE
ILME